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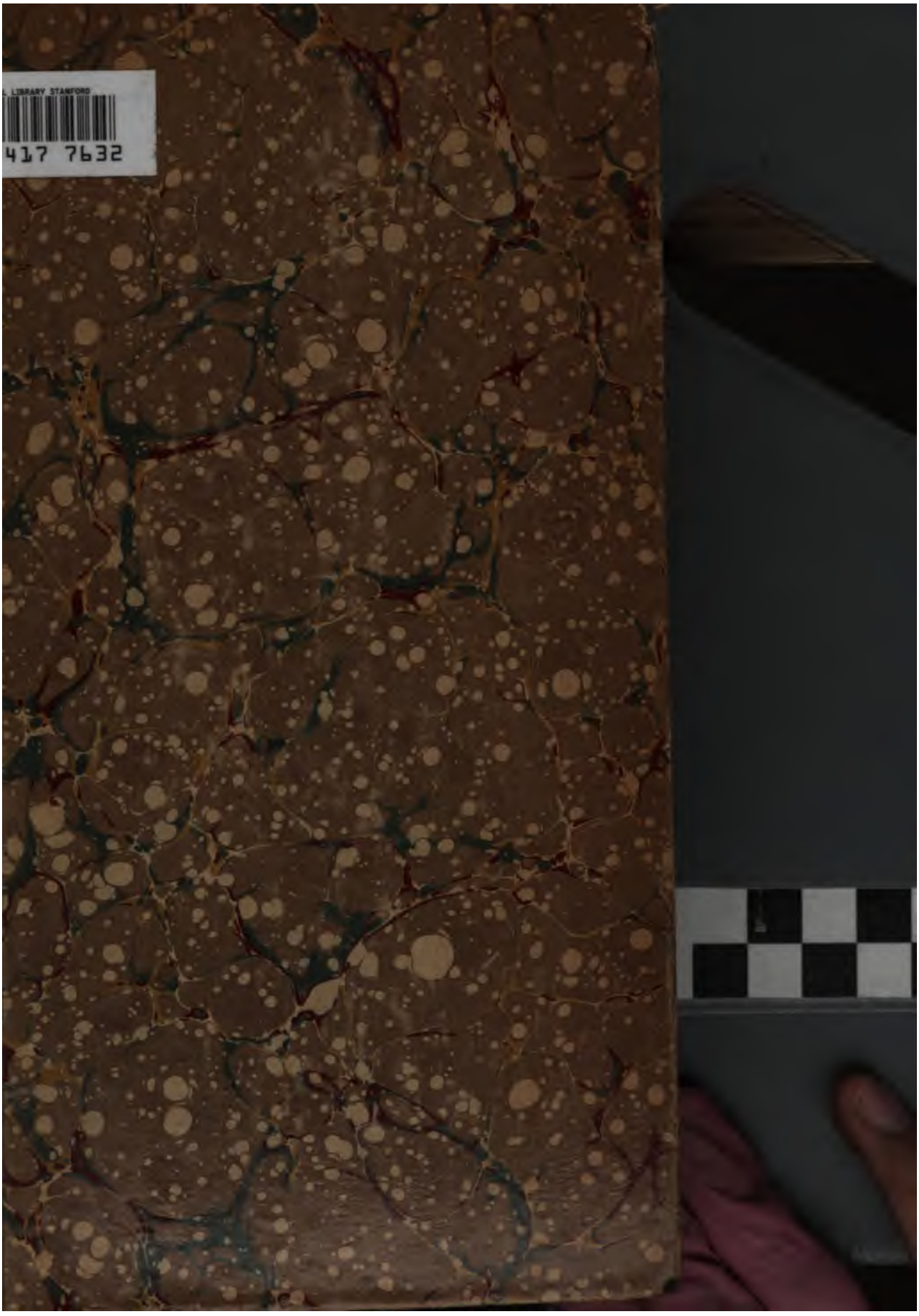
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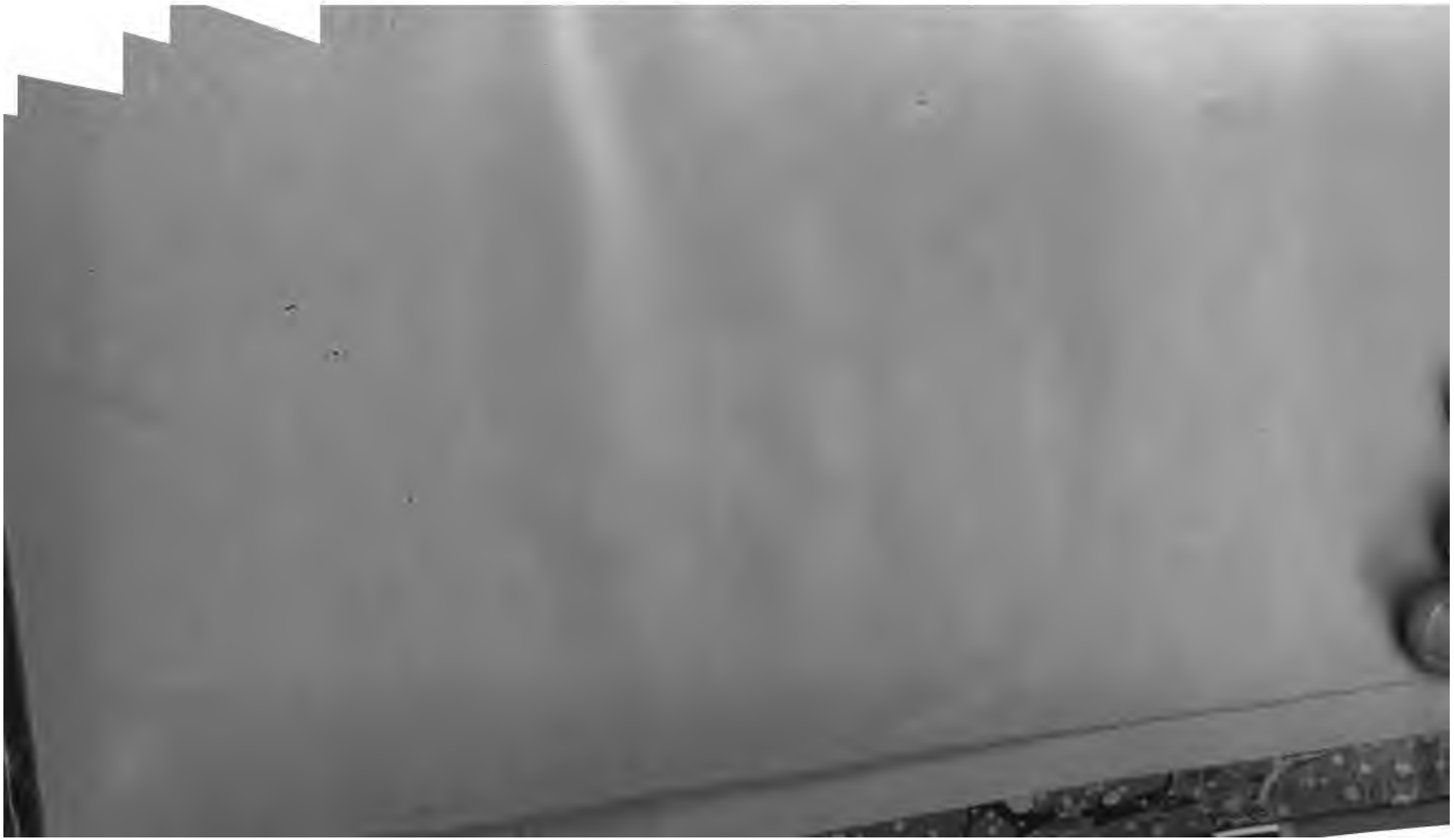

TWENTY-THIRD ANNUAL REPORT

Gt. Brit.

OF

THE LOCAL GOVERNMENT BOARD,

1893–94.

SUPPLEMENT

CONTAINING THE

REPORT OF THE MEDICAL OFFICER

For 1893–94.

Presented to both Houses of Parliament by Command of Her Majesty.

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PUBLIC HEALTH.

ANNUAL REPORT

OF THE

MEDICAL OFFICER

OF

THE LOCAL GOVERNMENT BOARD

FOR THE YEAR

1893-94.

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REPORT.

TO THE RIGHT HONOURABLE THE PRESIDENT OF THE LOCAL GOVERNMENT BOARD.

MEDICAL OFFICER'S REPORT.

SIR,

IN submitting to you, for presentation to Parliament, my annual report on the proceedings of your Medical Department for the year 1893–94, I would recall the fact that I have already laid before you a special report on "Cholera in England in 1893."* That report embodied a history of the cholera occurrences in question, and also a statement of the measures adopted by the Medical Department to control the disease. Further reference to cholera in relation to this country will, therefore, be concerned only with such general measures of administration as became necessary owing to the prevalence of that disease in foreign countries. As yet I am not in a position to refer, in more than brief terms, to the prevalence of cholera abroad since the epidemic of 1892. That prevalence, however, involved a continued danger to this country, and it was hence decided early in 1894 to retain for a second year the services of the four temporary Medical Inspectors who had been appointed at the beginning of 1893.

I.—*ADMINISTRATIVE RELATIONS OF THE MEDICAL DEPARTMENT.*

1. VACCINATION AND PUBLIC VACCINATION.

VACCINATION.

The digest of Vaccination Officers' returns, which I submit in Appendix A., No. 1, includes a statement with regard to 914,079 infants whose births were registered in England and Wales during the year 1891. It is the twentieth annual return made since the passing of the Vaccination Act, 1871, and it shows that the per-centage of the infants in question who remained finally unaccounted for as regards vaccination was 13·4, a larger proportion than in any of the previous years. In the Metropolis the corresponding per-centage was 8·8 in 1872; and it fell to 5·7 in 1881; but since then it has steadily increased until it reached no less than 16·4 for 1891. In the provinces the per-centage of registered births not finally accounted for in 1872 was 4·5, and with trivial oscillations it remained at that figure for some 10 years, but since then the per-centage has increased until in 1891 it reached 12·9. Both in the Metropolis and in the rest of England the greatest increase in default under the vaccination laws, thus indicated, set in during 1889. It was in May of that year that the Royal Commission was

* Reports and Papers on Cholera in England in 1893, with an Introduction by the Medical Officer of the Local Government Board. [C.—7539] 1894.

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appointed to inquire into the subject of vaccination, and since that date an increasing number of Boards of Guardians have more or less completely abstained from enforcing compliance with the law as to vaccination "pending the issue of the report" of the Commission. That report still remains to be issued.

INSPECTION OF PUBLIC VACCINATION.

During the year 1893 inspection of public vaccination was carried out by Medical Inspectors in 326 Unions. This inspection involved, as will be seen from Appendix A., No. 2, 1,429 Vaccination Districts, and in regard of 992 of these, situated in 291 Unions, the work of the Public Vaccinators was found to be such as to call for special recognition by way of award under section 5 of the Vaccination Act, 1867.

NATIONAL VACCINE ESTABLISHMENT.

The lymph issued by the National Vaccine Establishment was derived from the usual sources. The humanised lymph received was stored on 1,040 ivory points and in 7,830 capillary tubes. Including requests from India, the Colonies and also the Diplomatic and other Services, 4,322 applications were received during 1893 for humanised lymph; and in answer to these 1,020 charged ivory points and 6,787 charged capillary tubes were sent out. The supply of lymph furnished from calves vaccinated at the Animal Vaccine Station, was received on 18,981 large ivory points and in 76 capillary tubes; and in answer to 2,797 requests for calf-lymph 16,177 of the charged points and all the 76 capillary tubes were sent out. (*See* Appendix A., No. 3.)

The proceedings of the Animal Vaccine Station, which are summarised in Appendix A., No. 4, included the performance of 7,683 primary vaccinations. Of the persons thus vaccinated 7,590 returned for inspection. In 54 of these, vaccination proved unsuccessful at the first trial, but in no case was a third attempt requisite to success.

INSUSCEPTIBILITY TO VACCINATION.

In his annual reports for 1887 and 1888 my predecessor, the late Sir George Buchanan, drew attention to what is called "insusceptibility" of children to vaccination; the legal interpretation of the statutory term "insusceptible" being that vaccination has three times been unsuccessfully performed. In the former of the two reports reference is made to the following statement by Dr. Cory:—"Of my own vaccinations I may say that I "have in my time performed over 38,000 primary vaccinations "with human or with calf-lymph; and that it has only once "fallen to my lot to fail twice at an attempt at vaccination." Dr. Cory did not in the instance in question have an opportunity of making a third trial.

Since the issue of that report 44,673 additional persons have been submitted to primary vaccination at the Lamb's Conduit Street Station; 43,591 of them having returned for inspection. In the case of these 43,591 vaccinations all but 218 succeeded at the

first attempt. In one case only did failure result on a second attempt, and in no case was there a third failure or legal insusceptibility. It thus transpires that, in the hands of vaccinators connected with the Board's Vaccine Department, operating at one time with humanised lymph, and at another with calf-lymph, not a single case of insusceptibility has been found amongst over 81,500 persons submitting to the operation of primary vaccination. Insusceptibility must needs be a rare phenomenon. But, notwithstanding this, certificates of "insusceptibility" are by no means uncommon in certain districts of England. Thus, of 98,871 children on whom the operation of primary vaccination was performed in Metropolitan Unions during 1891, no less than 432 were certified to be "insusceptible." The details of the proceedings of the Animal Vaccine Station in this respect since 1887–88 are set out in the following Table:—

Year.	Total Primary Vaccinations.	Returned for Inspection.	Vaccination failed.		
			Once.	Twice.	Thrice.
1888–89 - -	7,048	6,962	20	0	0
1889–90 - -	7,567	6,937	49	0	0
1890–91 - -	7,220	7,134	39	1	0
1891–92 - -	7,529	7,448	18	0	0
1892–93 - -	7,616	7,520	28	0	0
1893–94 - -	7,693	7,590	54	0	0
Total -	44,673	43,591	218	1	0

2. Other Administrative Business of the Medical Department.

The ordinary work of the Medical Department during the year 1893–94, was necessarily somewhat modified by reason of the continued prevalence of cholera on the Continent of Europe, and of the importation of that disease into this country under circumstances to which I have already referred in detail in my special report on Cholera in England during 1893. But a considerable number of local inquiries and of conferences with representatives of sanitary authorities were held as to such matters as sites for isolation hospitals, byelaws, &c., and in addition to these, as also to special inspections in localities where cholera was alleged to have occurred, 42 sanitary districts were visited and reported on by Medical Inspectors. Many of these visits or

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inspection were undertaken because of the evidence of excessive mortality from infectious diseases, afforded by the quarterly returns of the Registrar-General: others wee instituted, by reason of statements contained in reports submitted to the Board by local medical officers of health; and others again were deemed necessary owing to the receipt of complaints as to local administration. In three of the latter instances the representations were received from County Councils, and in each instance a medical inspector was instructed to report to the Board as to the circumstances involved. An abstract of the 28 reports referred to will be found in Appendix A., No. 5. Some of these reports, however, call for more detailed notice, and they are consequently reproduced *in extenso*. The majority of these are concerned with the distribution of disease by reason of the contamination of public water supplies. This subject is one of pre-eminent importance to England, not only because, on the Continent of Europe, we are still face to face with cholera, a disease which owes its widest and most fatal distribution in this and other temperate climates to the agency of water contaminated by human excreta; but because even when the contaminating agent is insignificant in amount, and the point of contamination strictly localised, yet the resulting mischief is often as wide in its distribution as is the area of the particular water supply. In continuation, therefore, of the remarks which I had the honour of submitting on the subject of enteric fever and water supplies in my last annual report, I would now draw more particular attention to some further reports having a similar bearing.

ENTERIC FEVER AT WORTHING.

The borough of Worthing, situated on our southern coast, was, during 1893, the seat of an epidemic of enteric fever, which is, in many respects, without parallel in the sanitary history of this country. The epidemic involved "Worthing" proper, and West Worthing, which together constitute the borough; and in addition the villages of Broadwater and West Tarring, which abut on the northern boundary of the borough. The great burden of the epidemic fell on "Worthing," where, on a population of some 15,300, there occurred no less than 1,257 attacks of enteric fever in the seven months, May—November, 1893. Including attacks during the same period in the other localities named, the total reached 1,411.

Investigation of the epidemic was rendered unusually difficult by reason of the complexity of the conditions involved. Not only did the incidence of the fever on the several localities implicated differ both in amount and as to time of occurrence, but differences and also correspondences between these localities in such matters as water supply, sewerage and drainage, proved so intricate as to render inquiry into their influence, if any, on the occurrence of the fever, no light labour. When, however, this labour had been undertaken, and its results formulated, indication was obtained as to coincidence between the behaviour of the fever in one or other area, and the existence therein of

some particular condition or conditions. And in this way explanation was forthcoming as to the means whereby, at one time in "Worthing" and Broadwater, and at another time in West Worthing and West Tarring, the fever had been disseminated.

Dr. Theodore Thomson, whose report on the subject will be found in Appendix A., No. 6, recalls the fact that the previous history of Worthing, and the adjacent localities, in the matter of enteric fever, was distinctly favourable. Entire years had passed by without a death from that disease, and on but rare occasions had the borough death-rate from enteric fever even reached that for England and Wales as a whole. "Worthing" had also been practically free from the disease during the early part of 1893; but, following on a first case in the latter part of April, a sharp outburst of the disease took place in the first three weeks of May, and by May 28th no less than 268 attacks had occurred. Then came a marked abatement, but this was, in turn, followed by a further and rapid increase beginning about the middle of June, and culminating in an outburst of altogether exceptional magnitude in the early part of July. Indeed, in the six weeks, June 24th–August 4th, no less than 726 fresh attacks took place in the "Worthing" division of the borough. This occurrence was then once more followed by an abatement which, with occasional exacerbations, continued until the epidemic ceased as the month of December was reached. In point of time, the incidence of the disease on the village of Broadwater, resembled that on "Worthing;" but it was otherwise with the West Worthing division of the borough, and with the village of West Tarring, in which places the epidemic only manifested itself after the date at which the height of the epidemic in "Worthing" had been reached. During the earlier epidemic period in May, the public water service of Worthing had locally come under suspicion, and this suspicion was confirmed when it came to be ascertained as regards both "Worthing" and Broadwater, to both of which the "Worthing" water is laid on (1) that whilst there was heavy incidence of the disease on those of their inhabitants who were supplied with this water, there was all but immunity for those persons in the same areas who habitually drank water from local wells; and (2) that the West Worthing division of the borough and West Tarring village, which at this time were free from the epidemic, had altogether different water supplies. The "Worthing" public water-supply which, as came to be shown, caused the "Worthing" and Broadwater epidemic, is derived from three Chalk wells connected together by headings tunnelled in the same formation; the wells and works having in later years gradually come to be surrounded by an inhabited part of the town. With the increasing population in Worthing, it became necessary on several occasions to augment the water supply, and for this purpose, a large heading was early in 1893 driven from

the bottom of one of the wells, this work being commenced on March 13th. As the works progressed, it was found impracticable altogether to exclude from the public service some of the water entering the new heading through small fissures in the Chalk; and in the afternoon of April 14th, when a large fissure was struck, there was a sudden and great in-rush of water, which could not be controlled, and which from that date formed no small part of the total water-supply. In the fortnight ending April 28th, immediately following the in-rush of this water, there were no more than nine attacks of enteric fever in "Worthing"; but in the following fortnight, there were no less than 153, and simultaneously the outbreak manifested itself also in the village of Broadwater. Detailed investigation went to show that the soil, which to a depth of some 20 feet overlies the Chalk in the neighbourhood of the "Worthing" wells, was liable to sustained pollution by reason of leaky sewers; that access of any water lying in that soil to the public service must necessarily have involved risk of specific pollution of that service; and that the fissure which was struck on April 14th was actually in communication with the superficial soil in question. Herein, indeed, is to be found the explanation of the first phase of this epidemic; the precise source of the specific matter reaching the water remained, however, beyond actual proof. Chemistry had all along failed to detect in the water any definite impurity, and it was only in the later stage of the epidemic that the results of bacterioscopic examinations went to furnish conclusive evidence, not only of its being fouled by fæcal matter, but of its contamination by the specific material of enteric fever.

The fact that close upon 300 cases of enteric fever in "Worthing," occurred in the earlier period of the epidemic, April 29th–June 9th, may well, in view of the relation to the public water service of leaky sewers, which during this period must have been conveying typhoid dejecta, serve as an explanation of the great recrudescence which constituted the second phase of this serious epidemic which set in towards the end of June; but it does not account for the occurrence in West Worthing, and in the village of West Tarring, of an outbreak which, commencing as late as the fortnight ending July 7th, reached its maximum about one month after the culmination of the "Worthing" epidemic, and which, in the two places together, led by mid-October to the occurrence of 109 attacks. Enteric fever in these places could only in small part be assignable to use of "Worthing" water; for not only have both localities altogether different water supplies, namely, from the West Worthing water-works and from local wells, but the proportion of their inhabitants who by reason of business occupations, &c., would have had opportunity to use the "Worthing" water, was but small. Besides which, during the period April 15th–June 23rd, in which "Worthing" water was conveying the infection of enteric fever to its consumers, only a solitary case of that disease had occurred amongst the

2,186 people who formed the joint population of West Worthing and West Tarring. It was also shown that the distribution of the outbreak in these two places, bore no relation to the general distribution of the mains of the West Worthing water; on the contrary, it was limited in both localities to the lowest point on either slope of a ridge common to the two districts. And, after studying all the circumstances under which this latter outbreak took place, Dr. Theodore Thomson regards the evidence as pointing, not as was the case in "Worthing" proper to pollution of the water at its source, but to local infection of the water in certain of the mains.

ENTERIC FEVER AT CHESTER-LE-STREET.

Another outbreak of enteric fever which came under investigation is that which occurred during the winter of 1892–93 in the mining village of Chester-le-Street, and which was investigated and reported on by Dr. Maclean Wilson, one of the Board's temporary medical inspectors (*see* Appendix A., No. 7). Between October 1892 and the middle of the following March there occurred 58 cases and 4 deaths in 43 households. The total population of the village was 4,864 at the date of the last census. The principal incidence of the disease was upon two periods; 17 cases were notified between November 14th and January 24th, and 38 more between February 10th and March 19th, and the precise cause of the outbreak was somewhat obscured by the very general prevalence of faulty sanitary circumstances. There was overcrowding; sanitary shortcomings, some described as "glaring," attached to a number of the invaded houses; cowsheds were found to be badly ventilated and unsuitable for their purpose; and the village as a whole is described as having many of the sanitary defects of the old country hamlet combined with those of the modern pit village. But, whether disposal of sewage and excreta, house accommodation, or milk supply be considered, none of these could be found to account for the distribution of the fever. Indeed, some of the earlier attacks in households occurred under sanitary circumstances which left but little to be desired. But when the supply of water came to be considered the matter was otherwise. Of some 1,100 houses in the village about 60 per cent. are supplied by the Chester-le-Street Water Company, the remainder deriving their supply from the Consett Company. With two exceptions, both included in a group of early attacks which could be etiologically separated from the general outbreak, every household attacked was found to be using the water of the Chester-le-Street Company; and this although the homes of the sufferers were not grouped in any particular part of the village, but were scattered over nearly every part of it. The water in question is taken direct from the Stanley Burn, and is thence conveyed to a filter bed before its distribution to the village. On examining the burn above the intake it was found to receive the sewage, either in its crude state or after certain processes of irrigation, from scattered villages of from 20 to 150 houses; and it was estimated by the

MEDICAL OFFICER'S REPORT.

local health officer that the sewage of a population of 3,500 persons found its way either directly or indirectly into the Stanley Burn and its tributaries above the intake of the Chester-le-Street Company. Three miles above this intake was a group of cottages, draining directly into a tributary of the Stanley Burn, where 4 cases of enteric fever occurred in October 1892, 10 other attacks following in January and February 1893. With regard to the process of filtration to which this water is subjected it is worth recording that the sand in use for the filter-bed was derived from the banks of the River Wear close by, and that the Wear above this point receives the untreated sewage of a large population."

ENTERIC FEVER IN THE VALE OF PICKERING AND AT MALTON.

Amongst other occurrences of enteric fever which were inquired into by the Medical Department during the year under consideration were certain groups of attacks which were investigated by Dr. Bruce Low in villages situated on the banks of the River Rye in the Vale of Pickering and in the neighbouring town of Malton on the Derwent. (Appendix A. No. 8.)

The villages in question were those of Nunnington and Ness in the Kirkby Moorside rural district together with Butterwick and Brawby in the Malton rural district. After a period of almost complete absence of enteric fever, 31 attacks of this disease occurred in these four villages during the three months November 1892–January 1893, and careful inquiry into the causes of the fever made it clear that the disease could only be attributed to the use, for drinking purposes, of water dipped at each place from the River Rye. Not only was the incidence of enteric fever on the 600 inhabitants of these four riverside villages 60 times as great as on the remaining 17,000 to 18,000 people comprised in the two rural districts concerned, but within the four villages themselves every household invaded by the fever resorted to this river water for domestic purposes, whereas amongst a considerable number of their inhabitants using water from wells not a single case of enteric fever occurred. Between its rise from feeders in the Cleveland Hills and its approach to the villages in question the Rye is largely polluted. Thus some five miles above Nunnington village it receives the crude sewage of the town of Helmsley. Between Helmsley and Nunnington "town manure," including night soil from Leeds is spread upon fields bordering on or draining towards the river; and some of the Nunnington villagers themselves add to its pollution by the deposit of similar filth on their fields, allotments, and gardens, on either side of the stream above the point at which they draw their drinking water. It was hardly necessary, under such circumstances, to inquire as to opportunities for the specific contamination of the river water by the material of enteric fever, but as a matter of fact evidence on this point was in no way lacking.

Incidentally it transpired during the course of this inquiry that the town of Malton had an altogether exceptional history

in so far as enteric fever and diarrhœa in fatal form are concerned. Situated on the Derwent, four miles below the confluence of the Rye with that river, Malton was found to derive its water supply from the Lady-well sunk to a depth of 14 feet in the middle Oolite rock, and occupying some low-lying land close to the river bank. Into this well river water gained access as soon as the Derwent rose above a given point; the amount of river water reaching the well varying from mere leakages through holes and crevices in the banks, to complete submersion of the Lady-well by the swollen stream. Gradually it had come to be noted that the outbreaks of fever and of diarrhœa followed on seasons of flood in the Derwent, a river which was referred to locally in 1890 as containing "the sewage of all the towns and "villages situated near the Rye and its numerous tributaries." Up to the date of Dr. Low's inspection in 1893 but little had been done to secure the Malton water supply against pollution.

Enteric Fever in Trent-side Villages.

In another report Dr. Bruce Low deals at considerable length with questions of water supply in relation to enteric fever in some sanitary areas abutting on the River Trent, and notably in certain villages where a number of the inhabitants habitually resort to the river for their drinking water. (*See* Appendix A., No. 9.) Almost from its source in Biddulph Moor, on the northern borders of Staffordshire, the Trent becomes polluted with sewage, and before reaching the town of Gainsborough, immediately below which the villages in question are situated, it receives directly, or by means of its tributaries, either the crude sewage of, or the effluent from sewage farms serving, an enormous population. The nearest towns above the villages in question are Newark and Gainsborough, and these alone add to the pollution of the river the sewage of a combined population of some 30,000. Contamination of the river is further brought about by reason of the habitual use, on agricultural land draining towards the Trent, of the town manure and night soil from some of the largest and most populous boroughs of South Yorkshire and the North Midlands. Having facts such as these in view, it had for some time been matter of local medical belief that the use of the Trent water for domestic purposes was associated with the occurrence of enteric fever. But representations made by the Board to the local authorities on the point were met by rejoinders such as are commonly formulated by parochial committees; rejoinders which went generally to deny the existence of any such risk as that implied, and in one instance, did not hesitate definitely to assert that "the Trent water is wholesome." It was under these circumstances that Dr. Low's inquiry was instituted, and evidence was at once forthcoming to show, not only that the river water was greatly polluted, but that some of its more obvious pollutions were of an altogether revolting character; other facts elicited went far to prove the specific pollution of the Trent by the bowel discharges of enteric fever patients from

Newark and Gainsborough, as well as from other places. And when comparison was made, as regards enteric fever, between sets of villages in the Gainsborough rural district* grouped according to their water supply, it was found that of 192 attacks of that disease which could be heard of as having taken place in the district in the previous four and a half years, no fewer than 167, or 86·9 per cent., had occurred among a population under 6,000 living in villages, the main water supply of which was drawn from the River Trent, or from canals similarly polluted and communicating with the river; whereas only 25 cases, or 13 per cent. of the whole, had occurred in an aggregate population of over 13,000 in 41 villages using water from local pump wells. As bearing upon the quality of the pollutions liable to reach the Trent within the range of the river-side villages more specially in question, it may be mentioned that in the third quarter of 1893 some 50 or more cases of diarrhœa occurred in Owston Ferry, six of the attacks terminating fatally with choleraic symptoms. Owston Ferry fortunately lies lower down the Trent than most of the villages in which there is resort to the river water.

In connexion with this inquiry, Dr. Bruce Low elicited certain facts as to the existence of enteric fever in Newark, which are of interest, as indicating how large an amount of specifically diseased material reaches the Trent above the villages in the Gainsborough district. That fever was found to have been for some time past epidemic in Newark during the autumn months; and, apart from water supply, no sufficient cause for this could be found. Nearly half the population of the borough derived their water from local pump-wells which were, almost without exception, liable to pollution, and the remaining half used the public service, which was drawn from wells so situated and constructed as practically to supply Trent water. Of 297 cases of enteric fever which were known to have taken place in Newark during the three and a half years preceding Dr. Low's visit, 78·5 per cent. occurred amongst those who habitually consumed the river water, whereas only 21·5 per cent. took place amongst persons resorting to the polluted local wells. Newark has since provided itself with a constant supply of wholesome water from the New Red Sandstone. But the riverside villages below Gainsborough still resort to the Trent for their water.

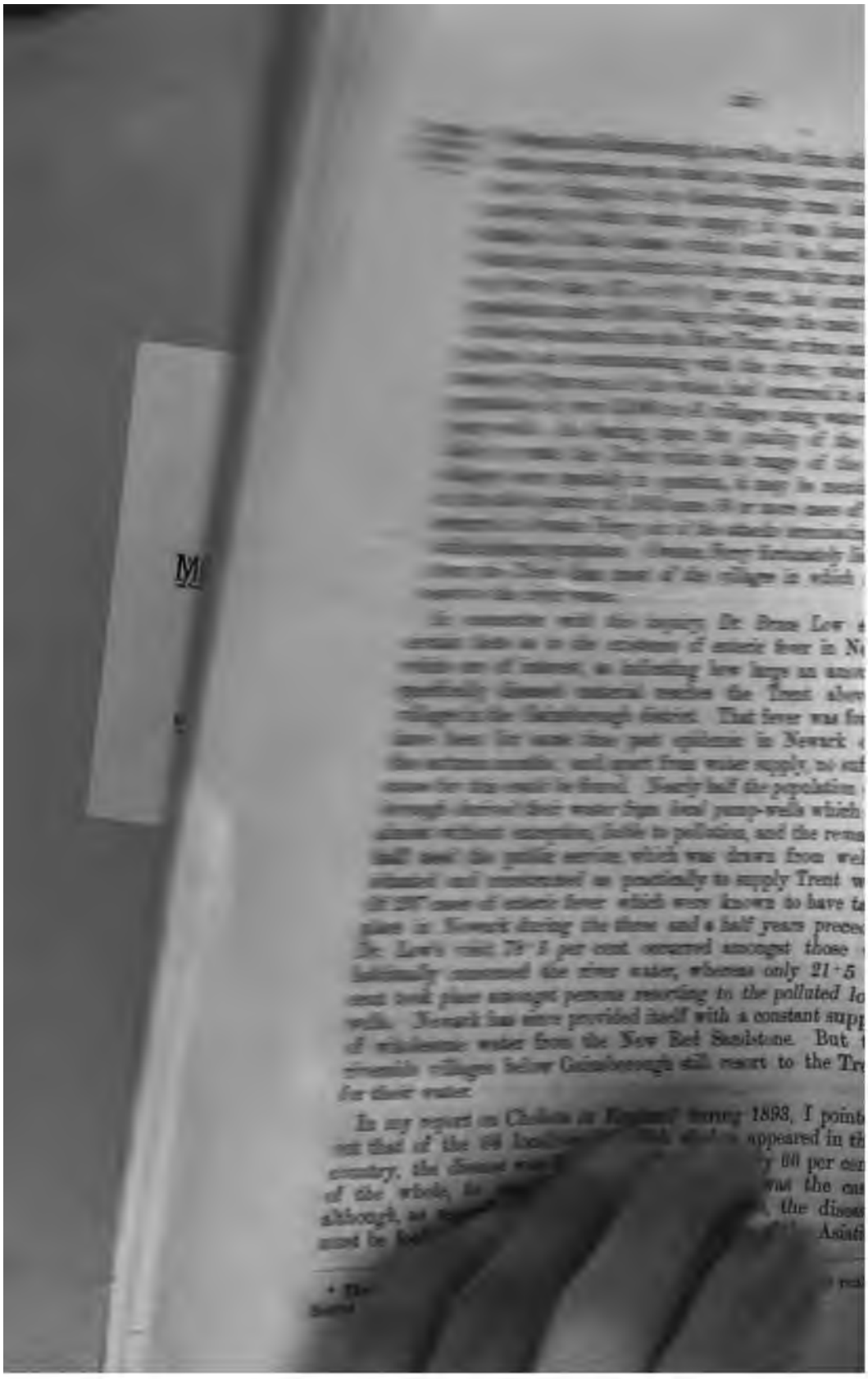
In my report on Cholera in England during 1893, I pointed out that of the 64 localities in which cholera appeared in this country, the disease was limited in 42, or in nearly 66 per cent. of the whole, to one single attack; and this was the case, although, as regards the majority of the attacks, the disease must be looked upon as having been true cholera of the Asiatic

* Three of these villages have since been included in the newly-formed rural district of Misterton.

type, whether it be judged by its clinical symptoms, by the outcome of bacteriological research, or by the heavy rate of mortality which it occasioned. Such a result, altogether unique in the history of cholera, was, I believe, largely due to the improved sanitary circumstances of England. But it is certain that if, in the cases of public water-services I have been considering, the specific material which found access to the waters had been that of cholera, instead of enteric fever, our cholera history for 1893 would have been the record of even greater disaster brought about, in most of the cases, by deliberate neglect. Even as the matter stands, such instances of neglect remain a matter of reproach to our local sanitary administration.

DIPHTHERIA THE HINCKLEY URBAN AND RURAL DISTRICTS.

Amongst a number of inquiries instituted in connexion with the prevalence of diphtheria, one was of more than ordinary interest. I refer to Dr. Wheaton's report on an outbreak of that disease in the Hinckley urban and rural districts. (*See* Appendix A., No. 10.) The town of Hinckley lies on a soil which is cold and retentive of moisture, and it is so situated, at a considerable elevation sloping towards the River Anker, as to be exposed not only to bleak winds, but also to fogs and mists. No single diphtheria death had been registered amongst its population of some 9,700 during 1892, and during the first eight months of 1893 only one death, namely one in February, had been ascribed to that cause. But it was otherwise as autumn advanced; and on his arrival at Hinckley, towards the close of November 1893, Dr. Wheaton found that in the 11 weeks antecedent to that date 28 deaths had occurred from diphtheria, and that, so far as could be judged in a town where notification of infectious disease was not in operation, between 200 and 300 attacks of the disease had taken place. As a result of his investigation into the causes of this outbreak, Dr. Wheaton arrived at the conclusion that the water supply, the milk service, and the general sanitary circumstances could not be held to have had concern with it. In also eliminating the influence of sewers and drains, both as regards the origin and spread of the disease, he points out that the cases were scattered more or less over the whole town; that there was no special prevalence of the malady where house-drains communicated with defective sewers; and that houses in the vicinity of sewer ventilators were not especially invaded. Indeed, he found that "in the majority of the houses in which "diphtheria had appeared, the drains were in good condition." With regard, however, to the midden-privies, he inclines to the view that, by reason of their foul effluvia and the impregnation of the soil around them, these structures had an influence on the fatality of the diphtheria, and in conferring susceptibility to its infection. There was, however, no question that school attendance had conduced to the outbreak. The disease was apparently confined to the households of the working classes whose children attended the public elementary schools; 89 per cent. of the known attacks were in children under 14 years of age; and in



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86 per cent. of the invaded households the first to be attacked was a child attending one or other of these schools. In the absence of a system of notification of infectious diseases, children continued to attend at school when a member of their family was suffering from diphtheria. On recovery they came back to school in clothes just as they had worn them during their illness; all attempt at isolation ceased on the disappearance of the more obvious symptoms; and no measures were adopted for the disinfection of the houses where the disease had occurred. The result of all this neglect was that there were abundant opportunities for the communication of the infection at school, and had it not been for the care and vigilance of individual teachers the diffusion of the disease would probably have been on a wider scale.

The origin of this outbreak remains involved in much obscurity. The epidemic commenced in September, after the re-opening of the schools, and there had been a large fair in the town at the end of August, which might easily have facilitated the introduction of isolated attacks of specific throat-disease. It is also worthy of note that there had been a somewhat wide outbreak of measles in Hinckley in the latter half of 1892; the prevalence being very fatal and very largely associated with that which was locally described as "septic exudation on the fauces "and throat." As the year closed, scarlet fever set in as an epidemic; but the outbreak, which continued into the spring of 1893, is stated to have been mild and without notable throat complications. Cases of scarlet fever were more or less maintained up to mid-August, some of the later deaths being associated with severe and malignant sore-throat; and in the autumn, when the diphtheria set in, certain deaths came to be ascribed to "scarlet fever and diphtheria." When Dr. Wheaton visited the various elementary schools in Hinckley he found in all the schools a number of children suffering from sore-throat or nasal catarrh. The sore-throat involved such symptoms as swelling of the soft palate, tonsils, and fauces generally; with bright red injected patches, studded with enlarged projecting mucous follicles, and exhibiting not unfrequently a white film or pellicle which was devoid of the characters of the membrane of diphtheria. In many cases there was also a puffy swelling of the tissues of the neck. These affections were also found to be rife among the children of the town generally, and in groups of children amongst whom there was no suspicion of diphtheria. What the precise relation of these "sore-throats" was to the antecedent measles and scarlet fever on the one hand, and to the subsequent and concurrent diphtheria on the other hand, Dr. Wheaton was unable to decide. But he points out that the cases of throat ailment described were not followed by paralyses, and that, "contrary to what appeared to be the case with respect "to the prevalence of diphtheria," these affections of throat and nares were especially prevalent in houses the condition and surroundings of which were markedly unwholesome. If, as I have

ventured to suggest elsewhere, measles and scarlet fever, as also morbid states of the throat induced by exposure to unwholesome circumstances, tend to a condition of the fauces favourable to the reception and multiplication of the diphtheria contagium, the incidence of diphtheria amongst Hinckley school children exposed to such imported contagium is not difficult to explain. But, on the other hand, it is important to remember that in throat-ailments, the clinical indications of which have seemed limited to mere congestion of the fauces with enlargement of the tonsils and yellow patches in the tonsillar follicles, active diphtheria bacilli have often been obtained in the yellow exudation.*

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Dr. Wheaton also discusses certain prevalences of diphtheria in the Hinckley rural district during 1893; and as regards a number of these the circumstances elicited corresponded in every essential particular with those recorded in connexion with the town outbreak. Thus, at Stony-Stanton, 22 attacks of diphtheria, with 14 deaths, occurred. There was a special incidence on school children, and on houses without any obvious sanitary defect, and there was widespread throat and nasal sickness which was in no way confined to households where cases of diphtheria had occurred. At Stoke Golding, where a limited but very fatal occurrence of diphtheria took place, there was also evidence of sore-throat and nasal discharge amongst the school children, but in this case the school was found to be defective in point of ventilation and otherwise. Only isolated cases of diphtheria could be heard of at Earl Shilton, Barwell, and Burbage, all three very populous villages; and in none of these villages could instances of any allied throat affection of the sort referred to be found amongst the school children.

Report on Outbreaks of an Epidemic Skin Disease.

During the summer of 1893 and the summer and autumn of the following year, outbreaks of a peculiar form of epidemic skin disease occurred in several of the Metropolitan Workhouse Infirmaries, notably those of Bethnal Green, City of London at Bow, St. Leonard's Shoreditch, St. Marylebone, and St. George-in-the-East. These outbreaks have been investigated and reported on by Dr. Copeman. (See Appendix A., No. 11.) This particular form of skin disease was first recognised in England in 1891, during which year cases had been observed in the wards of the Paddington and St. Marylebone Infirmaries; and the occurrence has been fully described by Dr. T. D. Savill, then Medical Superintendent of the Paddington Infirmary.† Previous outbreaks of apparently the same disease have, however, been recorded in other countries.

The disease bears some likeness both to pityriasis rubra and to acute general eczema, though for various reasons it cannot

* See, *e.g.*, Acute follicular diphtheria of the tonsils. Deutsche Medizinal-Zeitung, November 22nd, 1894.

† On an Epidemic Skin Disease, by Thomas D. Savill, M.D. Lond., H. K. Lewis, Gower Street, London, W.C. 1892.

well be classed under either of these terms. Provisionally, and in the absence of exact knowledge as to its etiology and pathology, the term "Epidemic Skin Disease" would appear to be the most convenient one under which to describe the affection. The various symptoms observed during the progress of this malady, the presence or absence of certain of which give rise to more or less distinct types of the disease, such as the "moist" and the "dry" forms, have been described by Dr. Savill in the accounts which he has published concerning the epidemic observed by him in 1891. His description may for the most part be taken as applicable to the cases observed during the outbreaks reported on by Dr. Copeman, with the exception that in many instances a distinct rise of body temperature, often synchronous with appearance of the rash, has been noted in the more recent prevalences. Temperature charts illustrative of this point are appended to Dr. Copeman's report. In those instances more particularly in which a number of persons were continuously under medical observation antecedent to attack by the disease, a prodromal stage was noticed during which there was general loss of appetite, accompanied by malaise and sensation of nausea, together with actual vomiting in some cases. This was witnessed, for instance, in the sick wards of the infirmary at Bethnal Green during the third week of April 1893, although it was not noticeable in the workhouse proper, nor in the "infirm" wards of that building. About a fortnight later a number of the infirmary patients in question presented symptoms of the epidemic skin disease. There appears, however, reason for believing that the disease, whether "moist" or "dry," does not always exhibit precisely the same order of symptoms. Even the rash on the skin is not an absolutely essential concomitant of the general constitutional disturbance by which the malady is characterised.

The duration of the disease has been very variable, and relapses at intervals of a few days or weeks have been frequent. During convalescence loss of epidermal structures has been common, the hair of the scalp having been completely lost in some cases, and the skin, especially that of the hands and feet, having been shed in large patches. Complete "casts" of the foot or hand have occasionally been obtained. The fatality rate in those cases in which death may be regarded as having been directly dependent on the epidemic malady has ranged from about 5 to 12 per cent. of the attacks. The fatal attacks have mostly occurred amongst the aged, and they have commonly been due to exhaustion; but in a small proportion of cases death has been preceded by albuminuria and uræmic coma.

With reference to the etiology of this disease the facts noted during the first outbreak which came under Dr. Copeman's observation, that, namely, which occurred at Bethnal Green, were, broadly, as follows:—The disease was mainly

confined to elderly persons of both sexes; such persons being for the most part inmates of the infirmary on account of chronic ill-health. The sanitary circumstances of the institutions affected could not be regarded as having had to do with the causation of the disease; but there are grounds for believing that the distribution of the malady and its severity were, in some cases, increased by the obviously defective conditions of cleanliness, ventilation, and nursing, to which some of the sick were subjected. Amongst the class of inmates affected, only those were attacked who happened at the time to be on a dietary which included a certain daily amount of milk; the amount ranging from half a pint to as much as three pints in exceptional instances. Patients in the "infirm" wards of the workhouse proper altogether escaped infection; and this, although they occupied buildings which closely adjoined and were aërially one with the infirmary wards. Indeed, they appeared to be, with the one exception of not having milk as part of their diet, in all respects similarly circumstanced to the inmates of the infirmary.

In the more recent outbreak at the infirmary of St. George-in-the-East, the first cases of the disease known to have occurred came under observation about a week subsequent to a change in the milk service of the institution. So also, on the expiration of about an equal period of time from the date of the substitution of preserved milk for the contract supply, a distinct diminution in the number of fresh attacks at once set in. That a marked rise and subsequent fall in the number of persons attacked should have corresponded, as it is shown to have done, with the commencing use and withdrawal repectively of a particular milk service can hardly be explained except on the theory that some condition of the milk service had causal relationship with the disease. The exact nature of this condition remains, thus far, undetermined; but it would seem to be for the most part a concomitant of a distinctly inferior quality of the contract milk. In this connexion it is of interest also to observe that in each of the outbreaks investigated by Dr. Copeman, and in which there appeared reason for suspecting such causal relationship, the contract for the milk supply was in the hands of the same contractor.*

On the other hand, in certain other institutions, amongst which the St. Marylebone Infirmary may be specially mentioned, there was found no reason for suspecting implication of the milk supply. In these institutions the disease has commonly been of a decidedly mild character. Moreover, the cases which arose did not occur in the form of a definite outbreak, the attacks being scattered over considerable periods of time. Many of the cases,

* Whilst this report is passing through the press, I learn that the same disease has occurred amongst the inmates of another workhouse establishment, and that the occurrence has coincided in point of time with a change in the milk service: the new supply having been provided by the same contractor as the one above referred to.

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especially the earlier ones, were also received into these infirmaries from outside, as, for instance, from workhouses, from Salvation Army Shelters, and from private dwellings; the latter being for the most part of the poorest class. Probably some of the cases in question were due to personal infection, the disease under consideration being apparently of a more or less infectious nature.

The pathology of this epidemic skin disease has been studied for the Board both by Dr. Copeman and, more fully, by Dr. Andrewes. Amongst other things, search has been made with a view of ascertaining whether the causation of the disease might reasonably be attributed to some specific organism; but thus far the search has been without success. An organism believed to be thus related to the disease has indeed been described by previous observers, but Drs. Copeman and Andrewes agree in regarding the organism in question, and which has been found in the exudation and skin flakes obtained from cases of this disease, as identical with a staphylococcus which can be obtained from the superficial layers of healthy skin. This "epidemic skin disease" evidently calls for further study, as opportunity may arise.

RETURNS OF NOTIFIED INFECTIOUS DISEASES.

In continuation of the practice commenced in my last annual report, I have set out in tabular form for each quarter of 1893 a statement of the number of notified cases of small-pox, scarlet-fever, diphtheria, and fever, as also of the number of deaths registered during the same periods from these several diseases. The tabulation applies to 81 districts, for which the data necessary for comparison of the rates of attack and of death were available.

By the aid of the Registrar-General, I am now, for the first time, further able to supply material for the same comparison, week by week, as well as quarterly and for the whole year, in the case of the 42 sanitary areas, including the port of London, which are comprised within the administrative county of London. In the case of these metropolitan returns, the various continued fevers are dealt with separately; and correction has been made for London as a whole as regards those instances in which there has been dual notification of the same attack. These several returns will be found in Appendix A. No. 12 and 12 (a).

LEAD POISONING BY MOORLAND WATERS.

For some years past the Board have from time to time had brought under their notice, in the reports of medical officers of health and otherwise, the fact that, at intervals, the water supplies of some of our large towns have been dissolving lead and producing lead poisoning on a somewhat wide scale amongst the water consumers. The occurrences in question were understood to be practically limited to towns and districts receiving soft moorland water. During the year 1885 the Sheffield water came suddenly to possess the power of vigorously dissolving the lead of the delivery pipes, with the result that the water was

found to be producing plumbism amongst a large number of the inhabitants of that town This Sheffield occurrence was made the subject of a report by Dr. Sinclair White, then Medical Officer of Health to the borough. In this report attention was drawn to the different behaviour of a water in respect of its ability to dissolve lead according as it came from one or other gathering ground, or as it represented the aggregate of water from different sources. And, not only was this diversity manifest in waters owning different local origins, but variability was also observed with alterations of temperature and other physical conditions. All Sheffield water-samples that dissolved lead were found to afford acid reaction; and Dr. Sinclair White spent much time and labour in the attempt to ascertain the source of free acid in these waters. But no definite determination was then made as to any single chemical condition the presence or absence of which stood in direct co-relation with the variations in the lead dissolving power of a water.

In his report on the proceedings of the Medical Department for 1887,* Sir George Buchanan submitted a paper by Mr. W. H. Power in which the latter, after study of the subject generally, and of the facts recorded respecting the Sheffield experience set out the considerations to be borne in mind in making further investigation of the conditions under which moorland waters at times acquire this power of dissolving lead. In concluding this paper Mr. Power, after summarising the observations arising out of the inquiries made at Sheffield, wrote as follows:—"Phenomena such as these if observed in the "biological laboratory in relation with the life processes of one "or another microphyte would not be difficult of comprehension. "The suggestion of them, therefore, in this connexion will have "raised suspicion whether the inscrutable behaviour of soft "moorland waters in regard of the plumbo-solvent ability may "not be related to the agency, direct or indirect, of low forms of "organic life. So that the question would seem to be arising "whether chemistry, which by itself has failed to afford satis-"factory explanation of the plumbo-solvency of moorland water, "may not get advantage by association of biology in the "problem."

Following on this, certain laboratory studies were made under the supervision of the Medical Department, of acid waters obtained from Sheffield, which were possessed of the power of dissolving lead, and of the organised forms contained in them; but it soon became manifest that no laboratory studies could supersede investigation of the circumstances of the origin of these waters and of the conditions under which they acquired their power of taking up lead. In 1890, the sanction of the Board was obtained to an inquiry into this subject by the Medical Department, such

* Supplement by the Medical Officer to the 17th Annual Report of the Local Government Board. [C.—5526.-I.] 1888.

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inquiry to include not only chemical and bacteriological study of the circumstances which might give to these waters the power of dissolving lead, but also simultaneous investigation at the various gathering grounds of the origin and characters of the waters having plumbo-solvent quality.

The interim report by Mr. W. H. Power contained in Appendix A, No. 13, gives some account of the progress, thus far, of this inquiry. Observations were in the first instance confined to the gathering ground at Burnmoor near Settle in Yorkshire, water from different parts of which were for some eighteen months examined week by week as to their physical, chemical, and bacteriological features; the results being recorded along with concurrent meteorological and other conditions, and compared with the ability of the same water week by week to take lead into solution. With the latter only one chemical condition has been found generally parallel, while none of the other conditions observed have been at all parallel. This is the amount of acidity of the water. And a similar correspondence was found to exist when the experience of Burnmoor was applied to other gathering grounds. For although the amount of lead taken up by one water as compared with another was not always found to be in direct proportion to the relative acidities of the two, yet for a particular water, variations in its lead dissolving property were always associated with corresponding variations in the amount of its acid.

The problems of plumbo-solvency of a moorland water thus came to be in large measure problems of the particular acidity connected with it, and accordingly experiments were undertaken to determine the nature of this acidity and its source. Having ascertained that a moorland water has not in itself any power of developing or increasing in acidity, it remained to be discovered where in its moorland history the water acquired its acid properties. It was soon ascertained that it was from the peat that the water derived this quality, and the question next arose whether the acidity of the water was due to merely chemical and physical re-action of the water and the peat, or to active organic life in the peat itself. The answer is indicated in the experiments so far reported on. They show that while neither moorland water nor a sterile decoction of peat can of itself develop acidity, the addition to either of a minimal amount of moist peat soil will cause bacterial growth in it, with increasing development of acid re-action and ability to dissolve lead. And they have further indicated two species of microbes which alone, among the many kinds of micro-organisms found in the samples of peat examined, have the power of producing acidity when added to a sterile decoction of peat.

At this stage, then, Mr. Power's forecast of 1887 would seem to be borne out as the result of the labours of the experts who have been engaged in this inquiry. The investigation is, how-

ever, by no means completed, and it is being continued throughout the current year.

II.—*CHOLERA PREVALENCES.*

RECRUDESCENCE OF CHOLERA IN GERMANY IN 1892-93.

In continuation of the account published in my last Annual Report of the epidemic of cholera in Europe during 1892, I would draw attention to a paper contained in Appendix A., No. 14, in which Dr. Barry has recorded the history of a recrudescence of that disease in Germany during the winter of 1892–93. This recrudescence involved three outbreaks. The first was in Hamburg, where the disease recurred in December 1892, and continued into the early part of the following year. The progress of this outbreak, which led to 64 attacks and 17 deaths, is shown to have been largely concerned with opportunities for personal infection, but there were groups of attacks in which the consumption of water, which had been contaminated by cholera discharges, must be regarded as having served to convey the disease. The second outbreak took place in Altona. The public water-supply of this town was described in my last report; it is derived from the Elbe at a point below that at which this river receives the sewage of Hamburg; and it is delivered to the population after a process of filtration through sand; a process which had formerly been deemed so far to remove from it the micro-organisms, benign or pathogenic, which it contains as to make the water a wholesome one for domestic purposes. This winter prevalence in Altona commenced about the time when the Hamburg outbreak just referred to was at its height, and not only so, but it was found that it had coincided with the ascertained presence of cholera bacilli in the Elbe itself, as well as in the water pumped up from the river to the Altona filters, and also with disturbances of those filters that seriously curtailed their function of removing micro-organisms from the water passing through them. Disturbances of one and another sort cannot be altogether avoided, and the story from Altona goes far to discount many of the claims that have recently been put forward as to the results that can be expected to follow the sand filtration of public water-supplies. One localised group of cholera attacks in Altona is referred to by Dr. Barry in some detail; the occurrence having been associated with the use of water from a well which had been accidentally subjected to contamination by infective material. In all, there occurred in Altona 45 cases and 24 deaths. The third outbreak in Germany occurred at the lunatic asylum at Nietleben, near Halle. Some account of this occurrence has already been given in a paper "On Water Filtration and Cholera," by Professor Koch—in my last Annual Report. More complete details as to the Nietleben outbreak are given in Dr. Barry's appended paper, from which it will be seen that cholera infection, which was, in all probability derived from Hamburg, was conveyed by means

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of sewage over the frozen surface of the asylum sewage farm in such a manner as to reach the water supply of the institution. As in most cholera outbreaks due to pollution of a general water-supply, a definite explosion of cholera ensued; 122 attacks and 52 deaths taking place in a community of 991 persons.

These occurrences of cholera in Germany may be regarded as mainly having had concern with 1892. With respect to European cholera during the following year, I have, as already stated, submitted to you a separate report, entitled: "Cholera in England during 1893"; but, owing to the fact that I have not yet been able to procure all the necessary official reports as to the prevalence of that disease in other States of Europe, I propose to defer the detailed record of the prevalance of cholera during 1893 in foreign countries until my next Annual Report. I therefore confine myself, for the moment, to a very general summary of such occurrences.

CHOLERA IN EUROPEAN AND OTHER COUNTRIES DURING 1893.

During the winter months 1892–93 cholera became for the time all but extinct in the greater number of the countries invaded during the summer and autumn of 1892. It persisted, however, to some extent, in European Russia, especially in Podolia and the Ukraine; in Persia; in certain western departments of France; and in the province of Yemen in Arabia. This continuance of cholera had, in Arabia, very far-reaching consequences, for to it must be attributed the epidemic which during 1893 attacked the Mecca pilgrims, causing amongst them, at the lowest estimate, some 50,000 deaths. By the aid of returning pilgrims the disease was carried into Asia Minor, Turkey in Europe, Tripoli, and Morocco. As the summer advanced cholera became more widely diffused in Russia, although, unlike the experience of 1892, the western provinces suffered most; the mortality in the eastern provinces of European Russia, in the Caucasus, and in Asiatic Russia being trifling in comparison with that of the previous year. In France cholera was reported from several departments, chiefly from those situated in the west and south. Recrudescences also occurred in Holland, Belgium, and Germany, but in none of these instances did any serious epidemic ensue. During June and July of 1893 Hungary became widely invaded, and the disease spread with considerable rapidity into Austria and Bosnia. Roumania, which had remained free during 1892, was also the scene of a cholera outbreak. The disease became seriously prevalent in certain parts of Italy, where it led to several hundred deaths. Spain was also to some extent invaded, and the disease extended to Tunis and Algeria in North Africa, to Senegambia in West Africa, and to the Canary Islands. Cases were also conveyed by ship to the United States and Brazil in the Western Hemisphere. In Western Asia, where the disease was probably related to a previous diffusion in Persia, a severe outbreak in the villayets of Bassorah and Baghdad led to upwards of 7,400 deaths.

§ English Cholera Administration.

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Cholera Survey.

Following on the rapid inspection of port and riparian districts which was instituted as cholera approached Western Europe in 1892, a much more complete Cholera Survey of port, riparian, and inland sanitary districts was organised early in 1893. All the 60 port sanitary districts of England and Wales, as also 35 urban riparian and nine rural riparian districts, were subjected to detailed inspection during the year by the Board's Medical Inspectors. In a similar way 88 inland urban, and 14 inland rural districts were inspected. Indeed, a considerable number of the Board's Medical Inspectors were engaged in this work throughout the year. The general supervision of this Survey was deputed to Dr. Barry, who has prepared a brief summary of the work done, together with two charts showing the localisation of the districts inspected. (*See* Appendix A., No. 15.) I propose to submit to the Board, in a separate volume, the results of the Cholera Survey of English ports, and I defer until my next annual report an account of the proceedings taken as regards inland sanitary districts, the survey of which was continued throughout 1894. Under these circumstances I would only observe, on this occasion, that much valuable work was effected as the result of the Survey, by way of securing local organisation and arrangements better fitted than heretofore to meet the risk of imported cholera, and that the importance of this work often became evident in connexion with those local experiences of cholera in this country during 1893, which have already been reported on.

Other Cholera Precautions.

Having regard to the previous history of cholera epidemics in Europe, and to the movements of the disease in the early part of 1893, I submitted to the Board on June 8th of that year a Memorandum pointing out that this country would probably run even greater danger from imported cholera during the then ensuing summer and autumn than had been the case during the serious epidemic of 1892. That Memorandum (*see* Appendix A., No. 16) was issued by the Board with a view of urging sanitary authorities to make such arrangements in advance as would enable them to prevent extension of any cholera that might be imported into their districts. The subsequent history of cholera in this country during the latter part of 1893 showed that the warning was fully justified. A special circular was also issued by the Board, on 22nd June 1893, to the sanitary authorities in the Metropolis, requesting them to take into early consideration the question of their being prepared in advance to meet any emergency that might arise in the course of the ensuing autumn (*see* Appendix A., No. 17.)

Cholera and Rag Importation.

During the year 1893 the attitude of the Board with regard to the importation of rags from countries where cholera was known to prevail underwent an important modification.

The imposition of restrictions on the importation of rags by the Local Government Board dates from 1883. In that year cholera became epidemic in Egypt, and Professor Koch, of

Berlin, studying the etiology of the disease in that country, announced his discovery of the cholera bacillus, and also stated that this micro-organism, according to his experiments, multiplied with great rapidity on moist linen. With a view of obviating danger to this country from imported rags, it was at first deemed desirable to give to the Medical Officer of Health at each port of arrival the duty of indicating the precautions—such as disinfection or destruction—that were in his opinion necessary in the case of rags from Egypt. But, whilst provisionally concurring in this action, my late predecessor, Sir George Buchanan, took occasion to state in a Memorandum on the subject, addressed to the Board on the 1st of August 1883: "It is not known that, as a matter of fact, cholera has been "ever introduced into England by rags." The discretionary power vested in the Medical Officer of Health under the Order of 1883 was ultimately found to give rise to diversity of practice in different ports, and thus to cause much inconvenience to importers and traders. Hence in subsequent years all Orders as to Rags issued by the Board imposed uniform restrictions.

During the proceedings of the International Sanitary Conference of Dresden, which were held in March and April 1893, and to which I shall again refer, the question as to the need for imposing restrictions on rags was on several occasions discussed. The different medical delegates were asked if any of them could give an instance of the communication of cholera by means of rags. Several were of opinion that linen, bedding, and clothing that had been recently soiled by cholera discharges had been the means of communicating the infection; but no one could record an instance in which rags, as an article of commerce, had served as a vehicle of cholera infection. On the contrary, the evidence given went to indicate that, in view of the circumstances of rag collection, and of the long interval—many months, and at times even years—which elapses between the date at which rags are collected and that at which they are ultimately exported in bales as merchandise, it was more than doubtful whether any cholera infection, if originally present in the rags, could survive under the circumstances. And it was further held that if the importation of rags was to be prohibited, the prohibition, to be consistent, ought to be maintained for a long period—even years—after the cessation of the epidemic which had led to the prohibition. Professor Koch, speaking on the subject, declared that in no single instance had there been, to his knowledge, an authenticated case of the transmission of cholera by means of rags of commerce. This view received the support of Professor Brouardel and Professor Proust of Paris, as also of the leading medical delegates of Europe. I, too, explained that it was in accordance with English experience.

The result of the debates at Dresden was that the following resolution was come to by the Conference, and was subsequently embodied in the Convention:—

"The only susceptible goods or merchandise the importation of which may be prohibited are:—

"1. Body linen, rags ('hardes') and clothes which have been worn (clothing—'effets à usage'); used bedding. When these goods are transported as luggage or on change of house (household removals) they are subject to special regulations.

"2. Rags ('chiffons et drilles').

"The following may not be prohibited: (*a*) rags compressed by hydraulic force, transported as wholesale merchandise in bales surrounded by iron bands, and with marks and numbers showing their origin, and accepted as such by the authorities of the country of destination; (*b*) clean clippings ('déchets neufs') coming directly from spinning, weaving, making up, or bleaching establishments; artificial wool ('Kunstwolle' 'shoddy'), and fresh paper shavings.

"The transit of susceptible merchandise or goods, so packed that they cannot be handled on the way, shall not be prohibited."

The signature of the Convention on behalf of Her Majesty's Government led to a reconsideration of the Orders as to Rags in force in England, and it was decided to revoke the existing regulations and bring them into conformity with the conclusions arrived at in Dresden. This was done by the issue of a new Order on 5th August 1893, supplemented by a further Order of 13th September 1893, whereby "Rags packed in bales and "imported as merchandise," were defined. These Orders will be found in Appendix A., Nos. 18 and 19, and they practically free from restriction all rags of merchandise imported into this country.

CONFERENCE WITH THE SANITARY COMMITTEE OF THE STATES OF JERSEY.

On the 17th of March 1893 the Sanitary Committee of the States of Jersey addressed a letter to the Board, asking whether they would consent to send an inspector to the Island of Jersey for the purpose of advising the States as to the best means of preventing the introduction of cholera into the island. Prior to their making this request, the Sanitary Committee had recommended the States of Jersey to have recourse to quarantine; but this proposal had been rejected by the States. The Sanitary Committee of the States, in preferring their request to the Board, asked that, if it were complied with, the conference should take place before the second week in April, because of anticipation that the annual influx into Jersey of Breton labourers, employed in the potato harvest, would commence about that date. Dr. Theodore Thomson was accordingly instructed to proceed to Jersey. He arrived in the island on the 4th of April, and, having made inquiries such as to enable him to advise the Sanitary Committee of the States, he conferred with that body on April 6th as to the measures proper to be taken by them with a view to dealing with cholera. Dr. Thomson, at this conference, advised:—the adoption of a system of medical inspection of vessels coming to Jersey, with supervision for a few days of all persons arriving in the island by whom cholera could be thought of as liable to be introduced; the provision of proper arrangements for the isolation of any cholera sick; a sanitary survey of the whole island, in which especial attention should be given to the various water-supplies, and

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notably to that for St. Helier; and the division of the island into districts to be suitably organised with a view of dealing with any imported cholera.

A Memorandum embodying recommendations as to the detailed action that should be taken with a view to these measures was left with the Sanitary Committee of the States, who expressed to the Board their high appreciation of the services which had been rendered by Dr. Thomson.

III.—*INTERNATIONAL SANITARY CONFERENCE OF DRESDEN.*

INTERNATIONAL SANITARY CONFERENCE OF DRESDEN.

On the 11th March 1893 the International Sanitary Conference of Dresden, to which incidental reference has already been made, was opened; the countries represented at it being—Germany, Austria-Hungary, Belgium, Denmark, Spain, France, Great Britain, Greece, Italy, Luxembourg, Montenegro, the Netherlands, Portugal, Roumania, Russia, Servia, Sweden and Norway, Switzerland, and Turkey. The British delegation consisted of Mr. George Strachey, Her Majesty's Minister Resident at Dresden and myself, as delegates, and Mr. H. Farnall, C.M.G., of the Foreign Office, as assistant delegate. The Conclusions arrived at by the Conference may be regarded as supplementing those embodied in the Venice Convention of 1892. The Venice conclusions aimed at preventing the entrance of cholera into Europe by the Red Sea and the Suez Canal; those adopted at Dresden sought to control cholera, both by land and sea, in case it should have made its way into Europe.

The Dresden regulations define a maximum beyond which restrictions shall not extend, and a minimum which must be imposed by all parties to the Convention. As regards both land and maritime traffic the Dresden conclusions approach nearer to the English standard than any arrived at on the occasion of any similar gathering; and with two exceptions the minimum of restrictions made obligatory coincided with the regulations which had long been in force in England. The first of these related to the importation of rags as to which, as already stated, the Board have since adopted the rules laid down by the Dresden Conference. The second had to do with the detention under "observation" of healthy persons landing from infected vessels. The regulation dealing with this subject was only assented to by the British delegation under the reserve that "observation" would, in the case of England, be limited to a supervision by the local sanitary authority of such passengers for a few days in their own homes. The report presented by the British delegates to the Earl of Rosebery, then Foreign Minister, will be found in Appendix A., No. 20; it gives a general account of the proceedings of the Conference and it only remains for me to add that the Convention was signed by Great Britain, Germany, Austria-Hungary, Belgium, France, Italy, Lichtenstein, Luxembourg, the Netherlands, Russia, Servia, and Switzerland; and that it is now in

operation. Together with the two other British delegates I had the honour of being appointed Her Majesty's Plenipotentiary for the purposes of the signature of the Convention.

IV.—*AUXILIARY SCIENTIFIC INVESTIGATIONS.*

ETIOLOGY OF ENTERIC FEVER.

The "Typhoid Bacillus," though it has come to be regarded as in all probability the essential cause of enteric fever, has never yet been experimentally proved capable of inducing that disease. Rodents inoculated, whether subcutaneously or intraperitoneally, with this bacillus, do indeed suffer fatal illness, but, as Dr. Klein has pointed out in the appendix to my report for 1892–93, the malady thus induced by him in the guinea-pig, is *not* of specific nature; it is, moreover, just as easily produced by injection of other and various microbes. In 1893–94, he has (Appendix B., No. 1) further tested the ability of the typhoid bacillus to produce enteric fever, using for his purposes monkeys and calves.

Dr. Klein's experiments on monkeys comprised two series; feeding these animals with the typhoid bacillus, and inoculating the microbe into their groins.

As to *feeding*, two monkeys were made to swallow, on several successive days, milk and bread to which had been added broth culture of the typhoid bacillus derived from the spleen of a person who had died of enteric fever. Neither of these monkeys suffered any illness whatever, and when they were killed two or three weeks later, no pathological lesions were found in them. Moreover, attempt to recover, by culture, the typhoid bacillus from their heart-blood and spleens failed in both instances.

As regards his *inoculation* experiments, however, Dr. Klein obtained results that were less unequivocally negative. In all, eight monkeys were included in this series, each of them being inoculated in considerable amount with gelatine culture of the bacillus derived, as before, from the spleen of enteric fever. Some, but not all, of these eight monkeys exhibited rise of temperature, and certain of them suffered more or less from loss of appetite and from diarrhœa; but none of them displayed any symptom that could be definitely attributed to enteric fever. Of the eight, two (which had been accidentally inoculated with a culture containing the streptococcus of erysipelas, as well as the typhoid bacillus) died on the 6th and 16th day respectively, and other five were killed at intervals varying between 11 and 16 days from the date of their inoculation. Examined post mortem, none showed any intestinal or other lesion parallel to those of enteric fever, except that in certain of them there was enlargement of the spleen, and in one enlargement of the mesenteric glands also. And bacteriologically, the evidence proved, in the main, negative; cultivation of the mesenteric gland-juice and of the heart-blood in no instance yielded the

typhoid bacillus, nor was this organism found, after death, in the intestinal contents of any one of these monkeys. As regards the spleen alone—and this only in those cases (three) in which that organ appeared enlarged—was there suggestion of positive bacteriological result. Thus, the spleen of one monkey (dead on the 6th day of mixed infection), yielded the typhoid bacillus in abundance and in pure culture; from that of another was obtained bacillus coli; while in a third instance, the monkey's enlarged spleen yielded a nondescript bacillus, exhibiting characters pertaining some of them to bacillus coli others to the typhoid bacillus.

Whatever may be the interpretation of the above results as regards the monkey, they were too indefinite for Dr. Klein's purpose, and he proceeded next to inoculation of calves. Four calves were injected by him subcutaneously in their groins with broth culture of the typhoid bacillus derived from the spleen of enteric fever. In none was there observed any rise of temperature or other symptom of illness; but in every one there occurred within three to four days of inoculation distinct enlargement of the inguinal lymphatic glands on the side operated on, which enlargement persisted until the calves were killed 10 days to a fortnight from the date of experiment. Post mortem, all the viscera were found normal; the four calves presented absolutely no lesion, except that in each instance the lymph glands of the region inoculated were enlarged and juicy. Bacteriologically the heart blood and spleen failed always on cultivation to yield micro-organisms, but the juice of the enlarged inguinal glands contained without exception the typhoid bacillus in abundance. The indication thus obtained that the tissues of the bovine animal can serve as a multiplying ground for the typhoid bacillus obviously deserves to be followed up by further experiments.

Other study by Dr. Klein in 1893–94 of the etiology of enteric fever has had to do with the stability, as separate species, of the typhoid bacillus and bacillus coli, in culture under laboratory conditions and in the process of transference from animal body to animal body. On the one hand bacilli of both sorts derived in each instance from *human sources*, were tested by him as to their vitality, and as to retention of their differential characters, in waters of various composition or quality; and on the other hand, the two sorts of bacillus obtained from outside the human body, namely, from excrementally polluted public *water supplies*, were transferred again and again from subculture to subculture, and were passed from peritoneum to peritoneum in separate series of guinea-pigs. But the result was always uniform. Whatever the source of the one and the other bacillus, and whatever the experimental conditions in the laboratory or in the animal body to which it was exposed, each retained unimpaired the differential features that characterised it at the outset. Incidentally it appeared in the course of these experiments that the persistence in a water medium both of the

typhoid bacillus and of bacillus coli, is largely governed by the chemical constitution of the water of experiment. The fact is noteworthy, and in this connexion these microbes are deserving of further study.

In his former report (1892–93) on protective inoculations, Dr. Klein insisted on the need for distinction between the protoplasm and the metabolic products of the microbe of a given disease. It is not, he pointed out, yet known in regard of many specific infectious diseases, how far the manifestations of the malady are due to the mere presence in the infected animal of a particular bacterium *per se*, or to the metabolic products which result from the life-processes of the microbe; and further, he urged, differentiation of "protoplasm" and of "product" is the more called for if, for the purpose of rendering the animal body proof against the virus of a disease, trustworthy materials are to be derived from the microbe associated therewith. Dr. Klein had been then working with a number of dissimilar microbes which each and all of them, when their intracellular substance was introduced into guinea-pigs, produced in these animals one and the same malady; and further, guinea-pigs thus made ill by inoculation with the intracellular poison of any one of his microbes were found by him to be protected against infection by any of the others. Dr. Klein inferred from this that the intracellular substances of all his microbes contained (physiologically) one and the same poison, and that the poison thus found common to all of them must needs be *non-specific*, and in no sense therefore related to the manifestation of the different diseases certain of these microbes have been found able to induce.

The particular microbes with which he had been experimenting included not only the typhoid fever bacillus but also Koch's cholera vibrio, and in so far as results of the above sort obtained by him in regard of the latter microbe seemed to call in question the protective value of those anti-cholera inoculations of the human subject which were being practised abroad, Dr. Klein's inferences appeared of some considerable importance. Koch's vibrio, however, as also the typhoid fever bacillus and the other microbes with which Dr. Klein had been working, belong to a group of micro-organisms having, whatever their virulence for the human subject, but feeble pathogenicity for rodents; large doses, whether of their protoplasm or of their metabolic products, being requisite for production of physiological effect in the guinea-pig. And accordingly it seemed desirable that judgment should at least be suspended until Dr. Klein's experimental observations of intracellular poisons had been extended to microbes which not only are pathogenic to man but also are virulent in small doses to rodents.

Among the microbes studied in the latter sense in 1893–94 by Dr. Klein (Appendix B, No. 2), the bacillus of anthrax and the diphtheria bacillus sufficiently well represent bacteria

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pathogenic alike to the human subject and to the guinea-pig: And as to these Dr. Klein has some interesting facts to record. Bacillus anthracis and bacillus diphtheriæ were tested by him as to the presence within their protoplasm of any (intracellular) poison; whether, that is, the protoplasm of the one and the other microbe is capable of inducing in guinea-pigs any definite illness. Further, guinea pigs that had been thus injected with the protoplasm, and protoplasm only, of the anthrax bacillus or of bacillus diphtheriæ, were tested by him as to their immunity against, or tolerance of, injection with the virus of anthrax and diphtheria respectively. And Dr. Klein found that neither the one nor the other bacillus included in its protoplasm any chemical poison; that these bacilli, apart from their metabolic products, exercised no physiological effect whatever when injected into guinea-pigs; and that guinea-pigs thus dealt with obtained thereby no immunity whatever against anthrax or against diphtheria.

These results of Dr. Klein's further study of protective inoculations are of a sort to strengthen his doubts as to the ability of the protoplasm of a given microbe to inhibit, when antecedently injected into the human subject, the physiological activities of the same microbe *quâ* its metabolic products. From Dr. Klein's point of view, therefore, the more matured experience of India in the matter of the anti-cholera inoculations there being practised, will be looked for with particular interest.

ETIOLOGY OF CANCER.

Concurrently with increase of late years in the mortality referred to Cancer, special attention has, by aid of improved methods of staining and preparing specimens, been directed to the histology of this disease, and thus it has come about that not a few observers are affirming the presence of parasites in cancerous tissue. Question has therefore arisen as to whether, in the interests of public health, cancer should not be regarded as coming within the domain of preventive, rather than of curative medicine, and accordingly preliminary investigation has been undertaken of the claim of Cancer to be regarded as a parasitic disease.

Dr. Klein, in a paper in this volume (Appendix B., No. 3) on "Psorosperms in their Relation to the Etiology of Cancer," enters on a critical examination of epithelial cancer from this point of view, and his paper is perhaps the more deserving of attention since he finds reason for abstaining from formulating any definite conclusion on the subject. He points out that as an essential condition of the problem to be solved, it is necessary to define, in regard of malignant growths in epithelial structures, what morphological appearances are peculiar to cancerous epithelium *but to no other epithelial tissue in health or disease;* and he goes on to institute strict comparison of the morphological elements of epithelial structures under various conditions normal and abnormal. As a result he deals with a number of appearances which, though they have been adduced as evidence of the presence in cancer of parasites or spores of

parasites, are nevertheless to be found in epithelial structures in circumstances where cancer is altogether out of question. In this way Dr. Klein eliminates from consideration a number of alleged parasitic forms as not necessarily foreign to the tissues of the animal body, and finally retains one only, namely, an amœba, described and termed rophalocephalus carcinomatosus by Korotneff, as unquestionably parasitic in nature. This amœba, however, though diligently sought for by Dr. Klein in many cancers, has not been found by him in more than a single instance, and he hesitates, therefore, to accept the organism as having definite relation to cancerous disease.

BACTERIOLOGY OF VACCINE LYMPH.

Certain bacilli obtained by Dr. Klein indifferently from calf lymph, from human lymph, and from small-pox matter, were reported by him in 1892–93 as possessing identical morphological characters. But inasmuch as these bacilli refused to grow and multiply on or in any of the artificial culture media employed by him to that end, Dr. Klein had not been able to ascertain in what way they differed—if, indeed, they differed at all—one from another, or to determine whether these microbes were dead or living.

In 1893–94, he has engaged in further attempt (Appendix B., No. 4), at differentiation of these bacilli; using lymph taken from the vesicles of the calf at intervals varying between 72 and 112 hours after vaccination of that animal, and employing as culture media certain nutritive materials not previously adopted by him. In all, his further attempts to grow the bacilli of calf lymph extended to above 100 culture experiments, but in no single instance did growth result; all his cultures proved sterile. He next sought to cultivate these bacilli in the living subcutaneous tissues of guinea-pigs and of calves. But here, again, he met with no success; and, for the present, the question as to the identity of the bacilli found by him alike in vaccine lymph and in small-pox matter, must remain undetermined.

CHEMICAL PATHOLOGY OF TETANUS.

Dr. Sidney Martin's investigation of the chemical pathology of tetanus, referred to in my last report as then in progress, has advanced on lines indicated by his previous researches respecting anthrax and diphtheria. The preliminary report now submitted by him (Appendix B., No. 5), gives account of his chemical examination of the tissues of persons dead of tetanus, of the albumoses and acid organic substances thus obtained by him from their blood and from their spleens, and of the physiological effect of these upon rodents. As yet, Dr. Martin has not ascertained whether similar albumoses and acid organic bodies are obtainable from animals in which tetanus has been experimentally induced, or from culture media in which the tetanus bacillus has been artificially grown; nor indeed whether any other tissues of the tetanus subject, as, for instance, the spinal cord, contain, in greater amount than the blood and spleen, those metabolic products of this bacterium upon which the disease tetanus would

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seem to depend. The result of Dr. Martin's further research in these directions, will form the subject of an additional report.

The albumoses obtained by Dr. Martin from the blood and spleen of tetanus when intravenously injected into rabbits, cause only rise of temperature; in none of the animals experimented with, was there any suggestion of tonic or clonic muscular spasm. He regards these tetanus albumoses, therefore, as in no way concerned in the causation of the symptoms which are characteristic of the tetanus seizure. But it is otherwise with certain non-proteid substances (the acid organic bodies already referred to), also obtained by him from the blood and spleen of his tetanus cases. These, as separated out in an ether extract of the above tissues, produce in rabbits and in mice, and indifferently by intravenous and by subcutaneous injection, definite and recurring spasms of the voluntary muscles closely corresponding to the seizures which characterise tetanus in the human subject. What is the precise nature chemically of the acid organic body, or bodies, contained in the ether extract from the blood and spleen of tetanus, is a question that is now occupying Dr. Martin's attention.

BACTERIOLOGY OF COMMON CATARRH:

Dr. Cautley has, as directed, commenced investigation (Appendix B., No. 6) of the relations, pathological and bacteriological, between the comparatively insignificant feverish catarrh which obtains the name of "influenza cold" and the more serious malady known as epidemic influenza. He has so far minutely studied 10 cases of "cold" of the above description, occurring at a season when influenza was not prevalent, but has not discovered any ground for regarding febrile nasal and naso-pharyngeal catarrh as having kinship with influenza properly so-called. Bacteriologically, indeed, he has not found the bacillus of influenza present in the nasal secretion of a single one of the cases of catarrh studied by him; and, further, these cases, while all of them affording many and various microbes, differed widely *inter se* as regards the organism, or organisms, most abundant in their secretions.

For the rest, Dr. Cautley has sought to ascertain (Appendix B., No. 7) which among the microbes that, like those now in question, get entrance to the human body presumably by way of the respiratory tract, are able to find lodgment in the thoracic glands; and similarly (Appendix B., No. 8) what are the microbes that entering the body by way of the alimentary tract may be detected in the glands of the mesentery. To this end he has examined, as cover-glass specimens and by culture, samples of the bronchial and mesenteric glands from the bodies of 30 persons whose death had resulted from accident, from acute disease, or from chronic malady.

OF THE BRONCHIAL:

With reference to the *bronchial glands*, Dr. Cautley found, in 60 per cent. of his cases, that no organisms were present, or at least none that would grow on the culture media (gelatine and agar) employed by him; and as regards the other 40 per cent.

such microbes as were found by him were in no single instance abundantly present, and few of them were bacteria of recognised pathogenicity. Tubercle bacilli were detected in only two instances, but bacillus coli was present in one half of the cases in which culture of the bronchial glands yielded living bacteria.

As regards the *mesenteric glands*, the facts observed by him were similar. Only exceptionally did these glands contain living organisms, and rarely was any one species abundantly present. The microbes identified were among those normally inhabiting the alimentary canal; the tubercle bacillus was in no instance found, and bacillus coli less often than had been the case with the bronchial glands.

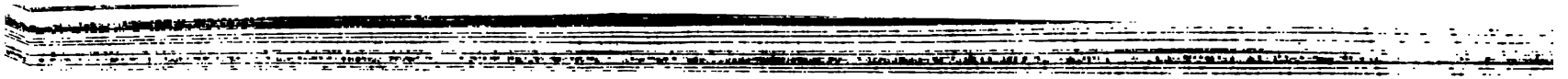
I have the honour to be,

Sir,

Your obedient Servant,

R. THORNE THORNE.

June 1895.



APPENDICES.

APPENDIX A.

No. 1.

DIGEST of the VACCINATION OFFICERS' RETURNS (made up to the 31st January 1893), with regard to CHILDREN whose BIRTHS were registered in the Year 1891.

THE following is the twentieth annual return under the Vaccination Act, 1871. Of 914,079 births returned to the Board by the several Vaccination Officers in England and Wales, as registered during the year 1891, the number which by the 31st January 1893 had been registered as successfully vaccinated was 693,117. This number is 75·8 per cent. of the whole. The children whose births were registered during the year, and who were not recorded as successfully vaccinated, numbered 220,962. Of this number, 96,351 were registered as having died unvaccinated. Out of the same number, 1,806 had been registered as insusceptible of vaccination; 9 as having contracted small-pox and, therefore, not needing to be vaccinated; 13,823 as having their vaccination postponed by medical certificate; and there remained on the Vaccination Officers' registers 108,973 children born in 1891, who had "removed," were "not to be traced," or were otherwise unaccounted for. If from the 914,079 births returned by these officers deduction of the deaths without vaccination be first made, it appears that of the remaining 817,728 children, there were registered at the time of the return 84·8 per cent. as successfully vaccinated; 0·2 per cent. as either insusceptible of vaccination, or as having had small-pox; and 1·7 per cent. as under medical certificate of postponement; leaving 13·3 per cent. as at that time still unaccounted for as regards vaccination.

The per-centage of children not finally accounted for as regards vaccination (*i.e.*, including cases postponed) was 13·4 of the total births (914,079); and this figure is given in the Summary of Returns, in sequence to the records of former years.

By the latter method of computation, it appears that the proportion of cases not finally accounted for in the metropolitan returns for 1891 was 16·4 per cent.; in the provincial returns, 12·9. Of the registered

App. A. No. 1.

Digest of Vaccination Officers' Returns, 1891.

births of the twenty years 1872–91, the corresponding proportion finally accounted for in regard to vaccination in each year respecti has been as follows:—

—	Metropolis.	Rest of England.	—	Metropolis.	Rest of Eng
1872	8·8	4·5	1882	6·6	4·5
1873	8·7	4·2	1883	6·5	4·9
1874	8·8	4·1	1884	6·8	5·3
1875	9·3	3·8	1885	7·0	5·5
1876	6·5	4·0	1886	7·8	6·1
1877	7·1	4·1	1887	9·0	6·7
1878	7·1	4·3	1888	10·3	8·2
1879	7·8	4·5	1889	11·6	9·6
1880	7·0	4·5	1890	13·9	10·9
1881	5·7	4·3	1891	16·4	12·9

In 1891 the proportion of cases unaccounted for, after deductio the postponed cases, in the metropolis and in the rest of Engl was 14·7 and 11·4 per cent. respectively.

	Returns, 1891.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
ENGLAND & WALES -	914,079	693,117	1,306	9	96,351	13,823	108,973	13·4
Ditto (excluding Metropolitan Unions).	779,558	594,678	1,374	8	82,800	11,531	89,167	12·9
METROPOLITAN UNIONS -	134,521	98,439	432	1	13,551	2,292	19,806	16·4
COUNTIES.								
ENGLAND:								
Bedford - - -	4,700	2,447	10	—	480	89	1,674	37·5
Berks - - -	7,497	6,249	11	—	649	110	478	7·8
Bucks - - -	4,904	4,220	11	—	427	59	187	5·0
Cambridge - -	5,483	4,762	3	—	497	82	139	4·0
Chester - - -	21,413	18,065	36	—	2,219	292	801	5·1
Cornwall - - -	8,922	6,610	6	1	963	170	1,182	15·2
Cumberland - -	8,406	6,784	8	—	931	211	562	9·4
Derby - - -	14,312	10,597	22	—	1,513	151	2,029	15·2
Devon - - -	17,396	14,528	17	1	1,542	300	1,008	7·5
Dorset - - -	5,140	4,146	3	—	363	58	570	12·2
Durham - - -	39,244	30,515	59	—	4,735	681	3,254	10·9
Essex - - -	25,020	19,892	63	—	2,155	548	2,362	11·6
Gloucester - -	15,858	10,959	32	—	1,606	372	2,889	20·6
Hereford - - -	3,015	2,516	2	—	293	56	148	6·8
Herts - - -	7,121	5,669	11	—	562	80	799	12·3
Huntingdon - -	1,367	1,212	1	—	109	14	31	3·3
Kent (extra-metrop.) -	22,496	18,791	56	—	2,076	355	1,618	8·6
Lancaster - -	132,954	99,057	259	—	15,042	1,968	15,708	13·3
Leicester - - -	12,454	2,769	5	—	1,851	55	7,774	62·9
Lincoln - - -	13,125	10,639	16	—	1,334	346	790	8·7
Middlesex (ex.-metro.)	16,458	13,038	55	—	1,322	142	1,901	12·4
Monmouth - -	10,035	8,148	16	—	1,084	206	581	7·8
Norfolk - - -	13,533	9,533	18	—	1,498	146	2,338	18·4
Northampton - -	9,644	3,458	5	—	1,064	86	5,031	53·1
Northumberland -	17,302	13,565	18	—	2,050	527	1,142	9·6
Nottingham - -	16,682	12,722	26	—	1,912	276	1,746	12·1
Oxford - - -	5,303	4,130	7	—	501	77	588	12·5

App. A. No. 1.

Digest of Vaccination Officers Returns, 1891.

	Returns, 1891.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
COUNTIES—*cont.*								
ENGLAND—*cont.*								
Rutland	544	463	1	—	64	2	14	2·9
Salop	6,943	5,995	7	—	591	86	264	5·0
Somerset	14,677	11,084	23	—	1,323	199	2,048	15·3
Southampton	18,501	15,741	28	—	1,470	256	1,006	6·8
Stafford	34,407	26,861	55	1	4,126	415	2,949	9·8
Suffolk	10,487	8,500	11	—	902	167	907	10·2
Surrey (extra-metro.)	15,245	12,013	21	—	1,226	313	1,672	13·0
Sussex	14,173	10,913	18	—	1,176	256	1,810	14·6
Warwick	25,699	19,195	61	—	2,814	266	3,363	14·1
Westmorland	1,824	1,618	3	—	150	16	37	2·9
Wilts	7,105	5,832	2	—	571	149	551	9·9
Worcester	19,016	15,875	43	1	1,862	234	1,001	6·5
York, East Riding	12,647	10,331	73	—	1,358	128	757	7·0
York, North Riding	11,166	9,052	16	—	1,173	178	747	8·3
York, West Riding	77,216	54,307	187	4	9,205	626	12,887	17·5
WALES:								
Anglesey	892	779	—	—	71	16	26	4·7
Brecknock	1,594	1,325	1	—	165	30	73	6·5
Cardigan	1,594	1,356	—	—	139	24	75	6·2
Carmarthen	4,208	3,676	1	—	402	73	56	3·1
Carnarvon	3,184	2,642	3	—	291	35	213	7·8
Denbigh	2,803	2,399	2	—	284	59	59	4·2
Flint	2,411	1,987	3	—	220	38	163	8·3
Glamorgan	26,810	22,483	38	—	3,014	358	912	4·7
Merioneth	1,623	1,375	—	—	194	33	21	3·3
Montgomery	1,774	1,521	—	—	164	29	60	5·0
Pembroke	2,347	1,934	1	—	239	54	69	5·2
Radnor	484	345	—	—	48	14	77	18·8

METROPOLITAN UNIONS.	RETURNS, 1891.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
Bethnal Green	5,001	2,457	6	—	629	43	1,866	38.2
Camberwell	7,360	5,408	24	—	650	246	1,032	17·4
Chelsea	2,829	2,069	2	—	285	24	449	16·7
Fulham	6,430	5,357	36	—	684	61	312	5·8
George, St., Hanover Sq.	3,101	2,700	16	—	271	19	95	3·7
George, St., in the East	1,962	1,599	4	—	191	12	156	8·6
Giles, St., and St. George	1,163	842	2	—	161	3	155	13·6
Greenwich	5,415	3,839	22	—	501	193	860	19·4
Hackney	7,001	3,474	19	—	665	46	2,797	40·6
Hampstead	1,521	1,294	11	—	108	13	95	7·1
Holborn	5,090	3,808	7	1	569	45	660	12·7
Islington	9,823	7,584	33	—	1,145	131	930	10·8
Kensington	3,823	3,104	9	—	344	48	318	9·6
Lambeth	9,117	6,621	38	—	998	127	1,333	16·0
Lewisham	2,481	2,121	8	—	199	14	139	6·2
London, City of	674	541	7	—	67	5	54	8·8
Marylebone	4,519	3,446	4	—	464	161	444	13·4
Mile End Old Town	4,131	1,760	9	—	300	159	1,903	49·9
Olave, St.	5,094	3,732	14	—	567	157	624	15·3
Paddington	2,968	2,172	16	—	254	32	494	17·7
Pancras, St.	7,210	5,363	39	—	681	221	906	15·6
Poplar	6,126	4,273	29	—	624	15	1,185	19·6
Saviour, St.	7,243	5,488	12	—	848	84	811	12·4
Shoreditch	4,615	3,633	10	—	567	50	355	8·8
Stepney	1,998	1,406	8	—	204	—	380	19·9
Strand	559	398	—	—	93	13	55	12·2
Wandsworth and Clapham	9,749	7,469	36	—	815	293	1,136	14·7
Westminster	852	623	2	—	82	44	101	17·0
Whitechapel	3,069	2,690	4	—	250	9	116	4·1
Woolwich	3,597	3,128	5	—	335	24	105	3·6
	124,521	8,439	432	1	17,551	2,292	19,806	15·4

APP. A. No. 1.

Digest of Vaccination Officers' Returns, 1891.

	Returns, 1891.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
BEDFORD.								
Ampthill	413	344	—	—	33	9	27	6·7
Bedford	1,365	936	8	—	101	73	247	23·4
Biggleswade	825	502	1	—	83	—	239	29·0
Leighton Buzzard	552	375	1	—	61	—	115	20·8
Luton	1,336	116	—	—	188	6	1,016	77·1
Woburn	219	174	—	—	14	1	30	14·2
BERKS.								
Abingdon	522	454	—	—	51	2	15	3·4
Bradfield	468	415	1	—	35	6	11	2·6
Cookham	561	463	—	—	60	18	20	6·8
Easthampstead	331	296	—	—	23	—	8	2·4
Faringdon	379	311	—	—	28	12	28	10·6
Hungerford	467	441	—	—	38	5	3	1·6
Newbury	549	447	1	—	39	12	30	7·6
Reading	1,966	1,470	5	—	266	38	287	14·1
Wallingford	383	346	1	—	27	2	7	2·3
Wantage	491	424	—	—	45	5	17	4·5
Windsor	939	817	3	—	48	6	65	7·6
Wokingham	451	363	—	—	27	4	37	9·5
BUCKS.								
Amersham	632	542	1	—	61	9	19	4·4
Aylesbury	769	664	2	—	77	15	11	2·4
Buckingham	321	282	2	—	27	1	9	3·1
Eton	772	686	2	—	57	3	24	3·5
Newport Pagnell	797	675	2	—	67	13	40	6·6
Winslow	237	176	—	—	23	5	33	16·9
Wycombe	1,376	1,195	2	—	115	13	51	4·7
CAMBRIDGE.								
Cambridge	996	832	1	—	99	16	48	6·4
Caxton and Arrington	263	240	—	—	22	—	1	0·4
Chesterton	844	742	—	—	65	8	29	4·4
Ely	567	498	1	—	52	16	20	6·1
Linton	383	339	—	—	31	4	9	3·4
Newmarket	915	804	1	—	86	20	4	2·6
North Witchford	506	448	—	—	44	6	8	2·8
Whittlesey	156	138	—	—	16	—	2	1·3
Wisbech	833	721	—	—	82	12	18	3·6
CHESTER.								
Altrincham	1,672	1,489	3	—	131	30	19	2·9
Birkenhead	4,252	3,718	8	—	426	28	72	2·4
Chester	1,454	1,258	5	—	131	29	31	4·1
Congleton	1,177	999	1	—	132	19	26	3·8
Macclesfield	1,710	1,490	1	—	171	24	24	2·8
Nantwich	2,153	1,771	5	—	231	41	105	6·8
Northwich	1,940	1,757	—	—	170	6	7	0·7
Runcorn	1,542	1,317	—	—	156	23	46	4·5
Stockport	4,100	3,110	13	—	552	77	348	10·4
Tarvin	313	272	—	—	30	2	9	3·5
Wirral	1,100	884	—	—	89	13	114	11·5

	Returns, 1891.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent of births.
CORNWALL.								
Austell, St.	956	815	1	—	94	26	20	4·8
Bodmin	490	401	—	—	42	7	20	7·7
Camelford	204	174	—	—	22	6	2	3·9
Columb, St., Major	373	337	—	—	22	6	8	3·8
Falmouth	609	147	2	—	70	3	387	64·0
Germans, St.	489	434	—	—	35	11	9	4·2
Helston	680	544	—	—	75	27	34	9·0
Launceston	448	405	—	—	30	4	9	2·9
Liskeard	739	612	1	—	59	11	56	9·1
Penzance	1,368	1,039	—	—	161	17	151	12·3
Redruth	1,525	975	—	—	228	31	291	21·1
Stratton	187	155	—	—	20	5	7	6·4
Truro	864	572	2	1	95	16	178	22·5
CUMBERLAND.								
Alston-with-Garrigill	81	72	—	—	5	—	4	4·9
Bootle	450	330	—	—	45	18	57	16·7
Brampton	283	196	—	—	12	18	7	10·7
Carlisle	1,596	1,366	3	—	149	59	19	4·9
Cockermouth	2,611	1,887	1	—	288	74	361	16·7
Longtown	177	150	1	—	11	3	12	8·5
Penrith	626	553	1	—	62	3	7	1·6
Whitehaven	1,954	1,665	2	—	175	17	95	5·7
Wigton	678	565	—	—	74	19	20	5·6
DERBY.								
Ashbourne	576	500	—	—	52	2	22	4·2
Bakewell	852	728	2	—	61	24	37	7·2
Belper	2,161	1,916	1	—	195	12	37	2·3
Chapel-en-le-Frith	681	512	2	—	74	18	45	9·3
Chesterfield	4,283	2,863	6	—	496	64	854	21·4
Derby	2,914	1,681	5	—	388	3	857	29·5
Glossop	747	581	2	—	99	4	61	8·7
Hayfield	349	308	—	—	31	1	9	2·9
Shardlow	1,749	1,478	4	—	137	23	107	7·4
DEVON.								
Axminster	423	385	—	—	26	6	6	2·8
Barnstaple	1,195	1,027	—	—	101	36	31	5·6
Bideford	609	537	—	—	47	19	6	4·1
Crediton	472	411	—	—	31	—	30	6·4
East Stonehouse	531	373	—	—	67	9	82	17·1
Exeter	1,077	839	—	—	115	46	77	11·4
Holsworthy	255	231	—	—	16	3	5	3·1
Honiton	548	479	1	—	42	8	18	4·7
Kingsbridge	442	406	—	—	28	—	8	1·8
Newton Abbot	1,873	1,700	5	—	121	10	37	2·5
Okehampton	437	387	—	—	35	3	12	3·4
Plymouth	2,535	1,931	4	—	312	27	261	12·4
Plympton St. Mary	695	558	—	—	56	4	77	11·9
Southmolton	418	374	—	—	37	6	1	1·7
Stoke Damerel	1,556	1,149	1	1	161	49	196	15·7
Tavistock	707	623	—	—	58	5	21	3·7
Thomas, St.	1,377	1,155	1	—	119	40	62	7·4
Tiverton	770	602	2	—	61	16	29	5·8
Torrington	350	311	—	—	22	5	12	4·9
Totnes	1,126	990	3	—	87	8	38	·1

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DORSET.								
Beaminster	301	263	—	—	24	3	11	4·7
Blandford	339	294	1	—	19	4	21	7·4
Bridport	313	277	—	—	25	3	8	3·5
Cerne	183	160	—	—	16	3	4	3·3
Dorchester	470	423	—	—	27	5	15	4·3
Poole	525	719	2	—	61	13	30	5·2
Shaftesbury	280	243	—	—	16	4	17	7·5
Sherborne	378	335	—	—	18	4	21	6·6
Sturminster	287	232	—	—	20	2	13	5·6
Wareham and Purbeck	452	407	—	—	34	4	7	2·4
Weymouth	824	379	—	—	68	—	383	46·5
Wimborne and Cranborne	508	414	—	—	41	13	40	10·6
DURHAM.								
Auckland	3,629	2,785	7	—	435	94	308	11·1
Chester-le-Street	2,017	1,671	3	—	263	14	66	4·6
Darlington	1,490	919	1	—	183	9	378	26·9
Durham	2,655	2,195	1	—	347	25	87	4·2
Easington	2,087	1,811	2	—	215	20	39	2·8
Gateshead	5,060	3,432	10	—	650	100	968	19·1
Hartlepool	2,530	2,118	6	—	261	31	114	5·7
Houghton-le-Spring	1,606	1,358	9	—	168	14	57	3·2
Lanchester	2,514	2,022	2	—	299	39	152	7·6
Sedgefield	772	656	—	—	83	10	23	4·8
South Shields	5,594	3,903	6	—	679	195	611	14·9
Stockton	2,259	1,603	1	—	318	38	249	14·9
Sunderland	6,118	5,119	11	—	701	81	206	4·7
Teesdale	623	488	—	—	70	7	58	10·4
Weardale	490	435	—	—	43	4	8	2·4
ESSEX.								
Billericay	515	423	5	—	35	13	37	9·7
Braintree	696	624	2	—	49	10	13	3·3
Chelmsford	923	783	—	—	77	22	41	6·8
Colchester	947	759	7	—	76	8	97	12·1
Dunmow	449	416	1	—	24	3	5	1·8
Epping	670	572	2	—	53	8	35	6·4
Halstead	425	382	—	—	36	—	7	1·6
Lexden and Winstree	575	522	—	—	42	5	6	1·9
Maldon	692	588	—	—	63	2	39	5·9
Ongar	278	238	—	—	23	9	8	6·1
Orsett	996	777	7	—	82	21	108	13·0
Rochford	952	782	1	—	74	48	47	14·0
Romford	1,718	1,323	—	—	146	22	227	14·5
Saffron Walden	464	414	—	—	27	1	22	5·0
Tendring	1,157	1,047	1	—	73	11	25	3·1
West Ham	13,562	10,240	37	—	1,275	365	1,645	14·8
GLOUCESTER.								
Barton Regis	5,969	4,911	23	—	555	126	354	8·0
Bristol	1,654	1,305	4	—	216	18	111	7·8
Cheltenham	1,268	788	2	—	144	97	237	26·3
Chipping Sodbury	455	384	—	—	32	12	27	8·6
Cirencester	541	393	—	—	40	7	101	20·0
Dursley	341	262	—	—	19	9	51	17·6
Gloucester	1,551	34	—	—	204	—	1,133	84·7
Newent	292	223	—	—	35	12	22	11·6
Northleach	236	204	—	—	16	3	13	6·8

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GLOUCESTER—*cont.*								
Stow-on-the-Wold	235	200	—	—	16	9	10	8·1
Stroud	1,094	877	2	—	98	24	83	9·9
Tetbury	150	81	—	—	18	—	51	34·0
Tewkesbury	400	201	—	—	45	3	151	38·5
Thornbury	458	406	—	—	32	7	13	4·4
Westbury-on-Severn	812	418	1	—	106	27	261	35·5
Wheatenhurst	170	62	—	—	14	13	81	55·3
Winchcomb	242	210	—	—	17	5	10	6·2
HEREFORD.								
Bromyard	281	217	1	—	25	7	31	13·5
Dore	224	180	—	—	31	3	10	5·8
Hereford	872	735	—	—	68	29	40	7·9
Kington	293	251	—	—	35	1	6	2·4
Ledbury	362	308	1	—	33	—	20	5·5
Leominster	340	287	—	—	33	10	10	5·9
Ross	459	377	—	—	54	4	24	6·1
Weobley	184	161	—	—	14	2	7	4·9
HERTS.								
Albans, St.	774	331	—	—	98	10	340	45·2
Barnet	1,234	1,006	3	—	92	33	100	10·8
Berkhampstead	440	378	—	—	44	2	16	4·1
Bishop's Stortford	561	504	—	—	36	2	19	3·7
Buntingford	158	137	—	—	6	1	14	9·4
Hatfield	190	168	—	—	11	—	11	5·8
Hemel Hempstead	424	327	—	—	28	6	63	16·3
Hertford	478	417	—	—	26	6	29	7·3
Hitchin	773	676	1	—	71	1	24	3·2
Royston	468	431	1	—	25	—	11	2·4
Ware	492	430	1	—	38	4	19	4·7
Watford	1,069	809	5	—	88	15	152	15·6
Welwyn	60	55	—	—	4	—	1	1·7
HUNTINGDON.								
Huntingdon	530	476	—	—	40	2	12	2·6
Ives, St.	425	378	1	—	33	5	8	3·1
Neots, St.	412	358	—	—	36	7	11	4·4
KENT (Extra-Metropolitan).								
Ashford, East	395	337	2	—	39	—	17	4·3
Ashford, West	533	452	1	—	54	14	37	9·5
Blean	564	486	1	—	39	11	27	6·7
Bridge	324	268		—	27	10	19	9·0
Bromley	1,880	1,511	3	—	263	51	62	6·0
Canterbury	474	412		—	37	2	22	5·1
Cranbrook	335	290		—	20	4	12	4·8
Dartford	2,276	1,825	6	—	201	37	207	10·7
Dover	1,130	857	2	—	105	30	136	14·7
Eastry	764	696		—	56	3	7	1·3
Elham	1,091	895	5	—	109	9	73	7·5
Faversham	781	702	10	—	58	3	8	1·4
Gravesend and Milton	651	455	6	—	64	—	126	19·3
Hollingbourn	379	283	—	—	29	2	15	5·2
Hoo	149	132	—	—	17	—	—	0·0
Maidstone	1,299	990	2	—	133	15	159	13·4

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KENT (EXTRA-METROPOLITAN)—*cont.*								
Malling	881	769	2	—	68	8	43	5·3
Medway	2,260	1,933	3	—	198	27	99	5·6
Milton	809	677	—	—	68	40	24	7·9
Romney Marsh	217	196	—	—	15	1	5	2·3
Sevenoaks	842	724	2	—	57	19	40	7·9
Sheppey	523	475	1	—	35	6	6	2·3
Strood	1,283	1,096	4	—	115	11	57	5·3
Tenterden	288	249	—	—	26	5	8	4·5
Thanet, Isle of	1,391	1,236	—	—	101	9	45	3·9
Tonbridge	1,412	863	5	—	142	38	364	29·1
LANCASTER.								
Ashton-under-Lyne	5,077	2,975	10	—	650	72	1,370	28·4
Barrow-in-Furness	1,932	1,681	—	—	179	5	67	3·7
Barton-upon-Irwell	2,830	2,342	5	—	321	75	87	5·7
Blackburn	6,864	5,349	13	—	821	94	587	9·9
Bolton	7,838	6,957	16	—	696	11	158	2·2
Burnley	5,728	3,278	20	—	789	143	1,498	28·6
Bury	4,137	2,539	6	—	539	7	1,046	25·5
Chorley	1,798	1,468	2	—	189	22	117	7·7
Chorlton	9,446	7,298	12	—	1,204	221	711	9·9
Clitheroe	627	507	—	—	56	26	38	15·2
Fylde, The	1,478	1,180	4	—	192	38	64	6·9
Garstang	335	295	—	—	23	1	16	5·1
Haslingden	3,013	2,374	2	—	308	38	291	10·9
Lancaster	1,556	1,311	7	—	166	19	53	4·6
Leigh	2,815	2,348	3	—	290	—	174	6·2
Liverpool	5,002	4,153	10	—	634	8	197	4·1
Lunesdale	190	167	—	—	15	3	5	4·2
Manchester	5,976	4,080	3	—	715	37	141	3·5
Oldham	6,319	303	4	—	1,042	6	4,964	78·7
Ormskirk	2,790	2,341	11	—	270	30	138	6·9
Prescot	5,380	4,293	20	—	686	105	276	7·1
Preston	4,872	3,540	8	—	782	47	495	11·1
Prestwich	4,984	3,937	3	—	485	196	363	11·2
Rochdale	3,174	2,566	10	—	344	48	206	8·0
Salford	7,467	5,477	10	—	1,020	190	770	12·9
Todmorden	930	625	—	—	106	—	199	21·4
Toxteth Park	4,278	3,065	15	—	532	150	516	15·6
Ulverston	1,310	1,123	6	—	111	—	70	5·3
Warrington	3,334	2,835	13	—	354	20	112	4·0
West Derby	15,321	12,834	27	—	1,623	152	685	5·5
Wigan	7,053	5,716	19	—	800	224	294	7·3
LEICESTER.								
Ashby-de-la-Zouch	1,292	817	—	—	150	17	308	25·2
Barrow-on-Soar	1,144	97	1	—	152	1	893	78·1
Billesdon	404	124	1	—	44	4	231	58·2
Blaby	1,200	120	1	—	173	3	903	76·7
Hinckley	763	195	—	—	94	3	471	62·1
Leicester	4,785	74	1	—	885	—	3,825	79·9
Loughborough	955	166	—	—	137	3	649	68·3
Lutterworth	273	218	—	—	28	6	21	9·9
Market Bosworth	518	396	1	—	71	5	45	9·7
Market Harborough	430	298	—	—	44	13	75	20·5
Melton Mowbray	630	204	—	—	73	—	293	46·5

	Returns, 1891.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
LINCOLN.								
Boston	1,012	842	1	—	91	47	31	7·7
Bourn	503	395	—	—	57	29	22	10·1
Caistor	432	369	1	—	38	8	16	5·6
Gainsborough	1,043	838	—	—	110	13	82	9·1
Glanford Brigg	1,208	1,041	2	—	117	13	35	4·0
Grantham	948	815	2	—	82	10	39	5·2
Grimsby	2,051	1,580	3	—	245	76	147	10·9
Holbeach	505	370	—	—	55	7	73	15·8
Horncastle	500	422	—	—	45	8	25	6·6
Lincoln	1,898	1,463	5	—	245	82	103	9·7
Louth	758	631	1	—	75	19	32	6·7
Sleaford	667	535	1	—	48	6	77	12·4
Spalding	561	448	—	—	47	8	58	11·8
Spilsby	624	541	—	—	43	16	24	6·4
Stamford	415	349	—	—	36	4	26	7·2
MIDDLESEX (Extra-Metropolitan).								
Brentford	3,901	3,187	21	—	348	11	334	8·8
Edmonton	7,844	6,174	16	—	596	73	985	13·5
Hendon	3,088	2,397	13	—	242	22	414	14·1
Staines	737	517	4	—	65	23	128	20·5
Uxbridge	888	763	1	—	71	13	40	6·0
MONMOUTH.								
Abergavenny	785	673	6	—	79	7	20	3·4
Bedwellty	2,654	2,089	—	—	313	82	170	9·5
Chepstow	608	498	—	—	60	5	45	8·2
Monmouth	838	666	—	—	74	26	72	11·7
Newport	3,650	3,055	9	—	394	44	148	5·3
Pontypool	1,500	1,167	1	—	164	42	126	11·2
NORFOLK.								
Aylsham	521	446	—	—	58	7	10	3·3
Blofield	344	286	—	—	39	9	10	5·5
Depwade	673	554	1	—	70	15	33	7·1
Docking	425	372	—	—	38	4	11	3·5
Downham	511	434	—	—	59	2	16	3·5
Erpingham	556	476	1	—	47	11	21	5·8
Faith, St.	356	253	—	—	38	4	61	18·3
Fleggs, East and West	323	277	—	—	33	3	10	4·0
Forehoe	358	293	—	—	29	5	31	10·1
Freebridge Lynn	343	279	1	—	30	6	27	9·6
Guiltcross	271	232	—	—	25	—	14	5·2
Henstead	296	231	1	—	32	—	32	10·8
King's Lynn	786	81	—	—	88	—	417	71·2
Loddon and Clavering	357	316	—	—	26	—	15	4·2
Mitford and Launditch	722	614	—	—	81	8	20	3·9
Norwich	3,217	1,458	4	—	432	7	1,316	41·1
Smallburgh	494	398	1	—	50	5	40	9·1
Swaffham	333	239	—	—	25	5	64	20·7
Thetford	492	425	—	—	42	4	21	5·1
Walsingham	551	459	2	—	55	12	23	6·4
Wayland	276	220	2	—	35	7	12	6·9
Yarmouth, Great	1,528	1,191	5	—	166	32	134	10·9

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Returns, 1891.

—	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
NORTHAMPTON.								
Brackley	296	170	—	—	24	16	86	34·5
Brixworth	318	212	—	—	40	4	62	19·5
Daventry	446	373	1	—	40	12	22	7·6
Hardingstone	304	214	—	—	19	6	61	26·4
Kettering	1,274	163	3	—	146	2	961	78·5
Northampton	2,709	166	1	—	269	22	2,163	87·3
Oundle	253	309	—	—	29	5	19	6·5
Peterborough	1,345	1,188	—	—	97	2	55	4·5
Potterspury	359	271	1	—	42	15	28	17·5
Thrapston	380	83	—	—	39	—	282	87·5
Towcester	317	246	—	—	39	4	28	17·5
Wellingborough	1,550	61	—	—	199	—	1,290	87·1
NORTHUMBERLAND.								
Alnwick	633	531	1	—	59	13	29	6·4
Belford	119	111	—	—	7	—	1	0·8
Bellingham	131	124	—	—	4	—	3	2·3
Berwick-upon-Tweed	497	455	1	—	34	4	3	1·4
Castle Ward	770	620	1	—	91	5	53	7·8
Glendale	213	193	—	—	14	—	6	2·8
Haltwhistle	193	132	2	—	18	7	34	17·5
Hexham	887	705	—	—	86	9	87	19·5
Morpeth	1,552	1,069	2	—	327	22	132	9·2
Newcastle-on-Tyne	7,178	5,736	7	—	810	194	431	9·7
Rothbury	139	120	—	—	16	2	1	2·2
Tynemouth	4,990	3,769	4	—	584	271	361	12·7
NOTTINGHAM.								
Basford	5,966	4,601	14	—	724	130	497	20·5
Bingham	350	264	—	—	29	—	57	16·2
East Retford	657	572	2	—	63	5	15	3·9
Mansfield	2,225	1,642	1	—	238	25	299	14·6
Newark	824	727	—	—	66	6	25	3·8
Nottingham	5,033	3,483	8	—	634	95	813	18·9
Southwell	493	411	—	—	51	9	22	6·3
Worksop	1,134	1,022	1	—	87	6	18	2·1
OXFORD.								
Banbury	785	293	1	—	90	23	379	51·1
Bicester	381	328	—	—	28	4	21	6·6
Chipping Norton	522	418	—	—	45	5	54	11·3
Headington	965	868	1	—	78	4	14	1·9
Henley	648	537	—	—	66	10	35	6·8
Oxford	617	509	4	—	60	15	29	7·1
Thame	365	314	—	—	25	7	19	7·1
Witney	629	545	1	—	65	6	13	2·9
Woodstock	391	318	—	—	44	4	25	7·4
RUTLAND.								
Oakham	275	238	—	—	34	1	2	1·1
Uppingham	269	225	1	—	30	1	12	4·8

	Returns, 1891.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
SALOP.								
Atcham	1,225	1,017	2	—	114	25	67	7·5
Bridgnorth	379	306	—	—	29	5	39	11·6
Church Stretton	133	108	—	—	19	2	4	4·5
Cleobury Mortimer	236	210	—	—	15	4	7	4·7
Clun	245	192	—	—	30	3	18	8·6
Drayton	373	334	—	—	32	3	4	1·9
Ellesmere	354	310	—	—	40	3	1	1·1
Ludlow	483	396	—	—	43	11	31	8·7
Madeley	679	621	1	—	44	1	12	1·9
Newport	407	358	—	—	44	—	5	1·2
Oswestry	811	725	2	—	59	8	17	3·1
Shifnal	305	247	—	—	27	11	20	10·2
Wellington	745	646	—	—	64	5	30	4·7
Wem	263	245	2	—	16	—	—	0·0
Whitchurch	307	278	—	—	15	5	9	4·6
SOMERSET.								
Axbridge	1,077	503	—	—	117	6	451	42·4
Bath	1,855	1,194	—	—	165	47	449	28·7
Bedminster	2,610	1,732	7	—	280	16	575	22·6
Bridgwater	979	757	3	—	101	22	96	12·1
Chard	689	588	1	—	63	14	23	5·4
Clutton	812	718	—	—	60	5	29	4·2
Dulverton	141	129	—	—	7	2	3	3·5
Frome	658	565	1	—	55	—	37	5·6
Keynsham	1,061	761	1	—	120	11	168	16·9
Langport	385	351	1	—	17	5	11	4·2
Shepton Mallet	465	403	1	—	21	4	36	8·6
Taunton	1,019	854	3	—	93	17	52	6·8
Wellington	503	445	1	—	32	6	19	5·0
Wells	711	609	1	—	62	10	29	5·5
Williton	436	391	—	—	33	7	5	2·8
Wincanton	513	452	3	—	25	3	30	6·4
Yeovil	763	632	—	—	72	24	35	7·7
SOUTHAMPTON.								
Alresford	170	158	—	—	8	2	2	2·4
Alton	382	333	—	—	29	4	16	5·2
Alverstoke	809	721	1	—	60	3	24	3·3
Andover	404	341	—	—	28	6	29	8·7
Basingstoke	551	334	—	—	45	2	170	31·2
Catherington	91	74	1	—	9	3	4	7·7
Christchurch	1,316	963	1	—	124	34	194	17·3
Droxford	306	268	2	—	23	4	9	4·2
Fareham	505	452	—	—	34	1	18	3·8
Fordingbridge	182	157	1	—	14	—	10	5·5
Hartley Wintney	613	494	2	—	66	10	41	8·3
Havant	287	263	—	—	16	2	6	2·8
Hursley	80	71	—	—	4	1	4	6·2
Kingsclere	265	239	1	—	22	—	3	1·1
Lymington	319	260	—	—	27	3	29	10·0
New Forest	389	345	—	—	25	9	10	4·9
Petersfield	311	276	—	—	16	5	14	6·4
Portsea Island	4,826	4,315	8	—	387	20	96	2·4
Ringwood	158	146	—	—	8	—	4	2·5
Romsey	299	278	—	—	18	—	3	1·0
Southampton	1,714	1,365	4	—	157	43	145	11·0
South Stoneham	1,538	1,291	1	—	127	28	91	7·7
Stockbridge	166	139	—	—	14	3	10	7·8
Whitchurch	175	150	—	—	14	6	5	6·3
Wight, Isle of	1,843	1,608	3	—	128	51	53	5·6
Winchester, New	802	700	3	—	67	16	16	4·0

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Digest of Vaccination Officers' Returns, 1891.

Returns, 1891.

	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed from end of births).
STAFFORD.								
Burton-upon-Trent	2,965	2,084	2	—	332	41	416	16·0
Cannock	1,497	1,159	1	—	182	1	154	13·4
Cheadle	779	665	—	—	65	3	46	6·2
Leek	1,079	911	2	—	114	29	23	2·9
Lichfield	1,308	1,145	3	—	129	4	27	2·4
Newcastle-under-Lyme	1,387	1,229	2	—	123	5	18	1·7
Seisdon	476	423	—	—	27	4	20	5·4
Stafford	930	698	3	—	84	11	48	7·6
Stoke-upon-Trent	4,907	3,694	1	—	679	51	382	9·0
Stone	989	857	1	—	92	18	21	2·3
Tamworth	724	585	—	—	69	10	60	9·7
Uttoxeter	401	354	—	—	39	—	8	2·0
Walsall	3,931	2,558	9	—	522	42	694	19·2
West Bromwich	5,107	4,134	18	—	616	107	232	6·4
Wolstanton and Burslem	3,275	2,719	4	—	382	3	162	5·4
Wolverhampton	5,043	3,649	9	1	665	81	638	14·3
SUFFOLK.								
Blything	740	657	—	—	56	4	23	3·4
Bosmere and Claydon	483	398	1	—	36	8	40	9·9
Bury St. Edmunds	439	365	—	—	44	17	13	6·9
Cosford	505	449	—	—	42	4	10	2·8
Hartismere	403	361	—	—	23	—	19	4·7
Hoxne	343	302	—	—	30	3	8	2·2
Ipswich	1,784	937	6	—	177	41	623	37·2
Mildenhall	252	228	—	—	18	—	6	2·4
Mutford and Lothingland	1,140	994	2	—	97	32	15	4·1
Plomesgate	551	469	—	—	53	2	27	5·1
Risbridge	537	456	—	—	60	9	12	3·9
Samford	359	302	—	—	24	4	6	2·0
Stow	591	514	—	—	55	7	15	3·7
Sudbury	787	672	—	—	52	17	46	8·0
Thingoe	473	434	1	—	26	4	8	2·3
Wangford	453	393	—	—	47	6	7	2·9
Woodbridge	670	589	1	—	62	9	29	5·7
SURREY (Extra-Metropolitan).								
Chertsey	932	704	2	—	61	34	81	13·0
Croydon	4,097	3,045	5	—	345	81	621	17·1
Dorking	414	353	—	—	24	5	32	8·9
Epsom	1,188	912	—	—	91	26	159	15·6
Farnham	1,468	1,206	2	—	144	3	113	7·9
Godstone	432	373	—	—	28	6	25	7·2
Guildford	1,384	1,109	4	—	110	44	117	11·6
Hambledon	535	482	—	—	33	6	14	3·7
Kingston	2,914	2,183	3	—	236	57	435	16·9
Reigate	864	721	1	—	58	49	35	9·7
Richmond	1,067	925	4	—	96	2	40	3·9
SUSSEX.								
Battle	498	387	1	—	14	17	49	13·3
Brighton	2,084	2,225	7	—	263	53	136	7·0
Chailey	201	158	—	—	15	3	25	13·9
Chichester	181	168	—	—	9	—	4	2·3
Cuckfield	505	479	—	—	38	14	34	8·5
Eastbourne	1,057	257	1	—	103	6	690	65·8
East Grinstead	540	421	—	—	42	24	53	14·3
East Preston	791	687	—	—	67	18	20	4·6

	Returns, 1891.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
SUSSEX—*cont.*								
Hailsham	430	334	1	—	36	5	34	9·1
Hastings	1,446	1,032	3	—	101	36	274	21·4
Horsham	701	599	1	—	52	12	37	7·0
Lewes	274	163	1	—	18	1	91	33·6
Midhurst	353	303	—	—	40	3	7	2·8
Newhaven	296	251	—	—	24	—	11	3·7
Petworth	251	220		—	26	2	3	2·0
Rye	302	258		—	25	4	15	6·3
Steyning	1,495	1,275		—	108	33	77	7·4
Thakeham	223	198		—	19	2	4	2·7
Ticehurst	448	343		—	43	5	57	13·8
Uckfield	605	381		—	56	12	156	27·8
Westbourne	194	175		—	11	3	5	4·1
West Firle	56	42		—	3	—	11	19·6
Westhampnett	582	527		—	33	5	17	3·8
WARWICK.								
Alcester	575	486	—	—	51	9	29	6·6
Aston	9,035	6,794	34	—	988	146	1,073	13·5
Atherstone	593	484	—	—	56	10	43	8·9
Birmingham	8,452	6,760	23	—	971	48	650	8·3
Coventry	1,727	587	—	—	228	—	912	52·8
Foleshill	701	491	1	—	70	—	140	21·3
Meriden	255	221	—	—	19	1	14	5·9
Nuneaton	650	302	—	—	83	—	265	40·8
Rugby	745	624	—	—	71	2	48	6·7
Solihull	835	683	3	—	74	20	55	9·0
Southam	271	230	—	—	22	3	16	7·0
Stratford-on-Avon	584	507	—	—	44	4	29	5·7
Warwick	1,276	1,036	—	—	137	23	80	8·1
WESTMORLAND.								
East Ward	366	312	—	—	45	1	8	2·5
Kendal	1,271	1,140	2	—	92	13	24	2·9
West Ward	187	166	1	—	13	2	5	3·7
WILTS.								
Alderbury	718	621	—	—	59	14	24	5·3
Amesbury	184	167	—	—	12	1	4	2·7
Bradford	287	242	—	—	36	—	9	3·1
Calne	202	167	—	—	15	8	12	9·9
Chippenham	582	500	—	—	47	25	10	6·0
Cricklade and Wootton Bassett.	338	290	—	—	24	5	10	4·4
Devizes	508	440			17	12	39	10·0
Highworth and Swindon	1,641	1,135			160	44	301	21·0
Malmesbury	319	232			24	11	52	19·7
Marlborough	224	199			18	1	6	3·1
Melksham	461	400			44	5	11	3·5
Mere	176	161			10	—	5	2·8
Pewsey	339	302			29	2	6	2·4
Tisbury	227	200			12	9	6	6·6
Warminster	318	246		—	26	5	41	14·5
Westbury and Whorwellsdown.	289	263		—	21	2	3	1·7
Wilton	292	258		—	17	5	12	5·8

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Digest of Vaccination Officers' Returns, 1891.

RETURNS, 1891.

	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases of postponement), per cent. of births.
WORCESTER.								
Bromsgrove	1,021	866	2	1	82	21	49	6·7
Droitwich	511	429	—	—	59	11	12	4·3
Dudley	5,736	4,939	14	—	597	28	158	3·2
Evesham	473	401	—	—	35	5	32	7·8
Kidderminster	1,165	1,003	—	—	104	4	54	5·6
King's Norton	3,770	2,993	16	—	348	77	336	11·9
Martley	411	367	—	—	36	—	8	1·9
Pershore	340	297	—	—	28	3	12	4·4
Shipston-on-Stour	415	356	—	—	39	7	13	4·7
Stourbridge	3,127	2,749	4	—	309	21	44	2·1
Tenbury	188	161	1	—	19	3	4	3·7
Upton-on-Severn	547	489	—	—	30	3	25	5·1
Worcester	1,312	825	6	—	176	51	254	23·2
YORK, EAST RIDING.								
Beverley	730	613	—	—	61	16	40	7·7
Bridlington	496	413	1	—	46	1	35	7·3
Driffield	572	504	1	—	48	3	16	3·3
Howden	369	329	—	—	29	—	11	3·8
Kingston-upon-Hull	2,571	1,996	11	—	335	22	207	8·9
Patrington	216	174	—	—	19	2	21	10·6
Pocklington	387	331	—	—	39	4	13	4·4
Sculcoates	4,728	3,870	48	—	516	28	266	6·2
Skirlaugh	261	224	—	—	21	4	12	6·1
York	2,317	1,877	12	—	244	48	136	7·9
YORK, NORTH RIDING.								
Aysgarth	112	97	—	—	11	—	4	3·6
Bedale	213	191	—	—	19	—	3	1·4
Easingwold	211	192	—	—	12	—	7	3·3
Guisborough	1,323	1,138	—	—	124	20	41	4·6
Helmsley	135	115	2	—	7	2	9	8·1
Kirkby Moorside	140	110	—	—	19	2	9	7·9
Leyburn	189	175	—	—	11	2	1	1·6
Malton	604	471	—	—	62	18	53	11·8
Middlesbrough	4,726	3,941	9	—	549	76	151	4·8
Northallerton	301	271	—	—	25	—	5	1·7
Pickering	310	254	—	—	41	6	9	4·8
Reeth	78	67	—	—	6	2	3	6·4
Richmond	318	271	—	—	26	4	17	6·6
Scarborough	1,194	920	5	—	138	31	400	36·1
Stokesley	291	254	—	—	25	2	10	4·1
Thirsk	310	278	—	—	25	—	7	2·3
Whitby	711	607	—	—	73	13	18	4·4
YORK, WEST RIDING.								
Barnsley	4,173	3,278	10	—	532	29	324	8·5
Bierley, North	3,594	2,789	6	—	397	42	750	22·9
Bradford	5,840	3,149	9	—	871	30	1,781	31·9
Bramley	2,215	1,749	1	1	243	15	206	10·9
Dewsbury	4,801	2,347	11	3	743	61	1,436	32·5
Doncaster	2,106	1,702	8	—	217	75	106	8·6
Ecclesall Bierlow	4,834	4,007	36	—	518	32	241	5·6
Goole	858	727	1	—	89	8	33	4·8
Halifax	4,868	545	1	—	675	11	3,636	74·9

	Returns, 1891.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
YORK, West Riding—*cont.*								
Hemsworth	577	485	—	—	60	6	26	5·5
Holbeck	866	722	2	—	103	11	28	4·5
Huddersfield	4,271	3,761	10	—	395	17	88	2·5
Hunslet	2,696	2,303	1	—	302	27	63	3·3
Keighley	2,036	69	—	—	276	—	1,691	83·1
Knaresborough	681	500	2	—	64	22	93	16·9
Leeds	7,396	6,158	30	—	804	43	361	5·5
Ouseburn, Great	358	307	1	—	31	6	13	5·3
Pateley Bridge	211	192	—	—	16	1	2	1·4
Penistone	571	499	1	—	49	6	16	3·9
Pontefract	2,239	1,862	2	—	291	9	75	3·8
Ripon	383	306	—	—	37	4	36	10·4
Rotherham	3,531	2,931	7	—	404	26	163	5·4
Saddleworth	609	103	—	—	86	—	420	69·0
Sedbergh	108	102	—	—	6	—	—	0·0
Selby	434	371	—	—	39	7	17	5·5
Settle	382	329	—	—	37	4	12	4·2
Sheffield	7,818	6,325	26	—	926	26	515	6·9
Skipton	1,161	709	4	—	148	33	267	25·8
Tadcaster	916	772	1	—	104	3	36	4·3
Thorne	416	329	—	—	35	13	39	12·5
Wakefield	3,245	2,679	9	—	385	23	149	5·3
Wetherby	356	282	—	—	43	4	27	8·7
Wharfedale	1,315	1,012	4	—	122	20	157	13·5
Wortley	1,549	1,296	4	—	157	12	80	5·9
ANGLESEY.								
Anglesey	365	314	—	—	31	7	13	5·5
Holyhead	527	463	—	—	40	9	13	4·2
BRECKNOCK.								
Brecknock	391	340	1	—	37	5	8	3·3
Builth	205	169	—	—	27	6	3	4·4
Crickhowell	741	600	—	—	72	12	57	9·3
Hay	257	216	—	—	29	7	5	4·7
CARDIGAN.								
Aberayron	283	250	—	—	16	—	17	6·0
Aberystwith	471	398	—	—	39	9	25	7·2
Cardigan	410	327	—	—	45	10	28	9·8
Lampeter	236	208	—	—	21	4	3	3·0
Tregaron	194	173	—	—	18	1	2	1·5
CARMARTHEN.								
Carmarthen	927	820	—	—	87	9	11	2·2
Llandilofawr	617	537	—	—	67	1	12	2·1
Llandovery	290	249	—	—	19	15	7	7·6
Llanelly	1,899	1,640	1	—	188	46	24	3·7
Newcastle-Emlyn	475	430	—	—	41	2	2	0·8

APP. A. No. 1.

Digest of Vaccination Officers' Returns, 1891.

	Returns, 1891.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
CARNARVON.								
Bangor and Beaumaris	964	828	3	—	90	12	31	4·5
Carnarvon	1,046	798	—	—	105	1	142	13·7
Conway	632	530	—	—	57	13	32	7·1
Pwllheli	542	486	—	—	39	9	8	3·1
DENBIGH.								
Llanrwst	343	287	—	—	38	10	8	5·2
Ruthin	267	238	—	—	25	2	2	1·5
Wrexham	2,193	1,874	2	—	221	47	49	4·4
FLINT.								
Asaph, St.	672	579	2	—	66	7	18	3·7
Hawarden	488	381	—	—	23	12	72	17·2
Holywell	1,251	1,027	1	—	131	19	73	7·4
GLAMORGAN.								
Bridgend and Cowbridge	1,854	1,558	2	—	237	20	37	3·1
Cardiff	6,351	5,233	27	—	639	15	437	7·1
Gower	311	268	—	—	22	18	3	6·8
Merthyr Tydfil	4,656	3,905	4	—	548	155	44	4·3
Neath	2,169	1,876	1	—	251	16	25	1·9
Pontardawe	792	699	—	—	71	14	8	2·8
Pontypridd	6,441	5,253	—	—	849	120	219	5·3
Swansea	4,236	3,696	4	—	397	—	139	3·3
MERIONETH.								
Bala	132	110	—	—	18	4	—	3·0
Corwen	411	349	—	—	45	5	12	4·1
Dolgelley	325	275	—	—	40	9	1	3·1
Festiniog	755	641	—	—	91	15	8	3·0
MONTGOMERY.								
Forden	414	346	—	—	42	10	16	6·3
Llanfyllin	494	413	—	—	54	10	17	5·5
Machynlleth	287	258	—	—	20	2	7	3·1
Newtown and Llanidloes	579	504	—	—	48	7	20	4·7
PEMBROKE.								
Haverfordwest	913	731	—	—	105	30	47	8·4
Narberth	461	414	—	—	35	2	10	2·6
Pembroke	973	839	1	—	99	22	12	3·5
RADNOR.								
Knighton	337	204	—	—	27	14	62	24·8
Rhayader	177	141	—	—	21	—	15	8·5

No. 2.

List (alphabetically arranged) of 326 Unions inspected during the Year 1893, with reference to the Proceedings under the Vaccination Acts, 1867 and 1871, and an Account of the Awards certified by the Board as payable to the respective Public Vaccinators out of County Funds.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union. Minimum.	Range of Awards in each Union. Maximum.	Total Sum awarded in each Union.	Medical Inspector.
			£ s. d.	£ s. d.	£ s. d.	
Abingdon	6	5	3 15 0	12 9 0	31 6 0	Dr. Sweeting.
Alcester	5	5	3 15 0	8 3 0	30 3 0	„ Wilson.
Alderbury	5	2	2 3 0	11 12 0	13 15 0	Mr. Royle.
Alresford	2	2	4 4 0	9 1 0	13 5 0	Dr. Sweeting.
Alverstoke	1	1	—	—	74 4 0	Do.
Amesbury	2	1	—	—	5 11 0	Mr. Royle.
Ampthill	4	4	5 14 0	11 9 0	33 12 0	Dr. Bruce Low.
Andover	5	4	2 9 0	18 4 0	31 8 0	„ Sweeting.
Asaph, St.	5	5	5 12 0	12 8 0	42 17 0	Mr. Royle.
Aston	7	7	6 18 0	84 19 0	217 3 0	Dr. Wilson.
Atcham	7	6	3 7 0	48 12 0	74 12 0	„ Wheaton.
Atherstone	2	2	10 5 0	23 16 0	34 1 0	„ Wilson.
Auckland	9	7	8 3 0	24 18 0	124 7 0	„ Fletcher.
Austell, St.	7	3	4 3 0	26 14 0	47 9 0	„ Horne.
Bala	1	—	—	—	—	Mr. Royle.
Banbury	7	2	4 6 0	5 4 0	9 10 0	Do.
Bangor and Beaumaris	6	4	3 3 0	16 19 0	33 10 0	Do.
Barnet	5	4	3 12 0	14 17 0	36 11 0	Do.
Barton Regis	6	4	9 14 0	39 17 0	76 7 0	Do.
Beaminster	5	3	2 5 0	7 9 0	13 13 0	Dr. Fletcher.
Bedford	8	7	4 12 0	18 2 0	49 16 0	„ Bruce Low.
Bethnal Green	2	2	21 12 0	62 11 0	84 3 0	„ Sweeting.
Beverley	5	4	2 3 0	26 14 0	33 14 0	„ Bruce Low.
Bicester	7	4	1 6 0	14 2 0	20 4 0	Mr. Royle.
Bigglewade	6	5	3 9 0	9 15 0	34 7 0	Dr. Bruce Low.
Birmingham	1	1	—	—	153 16 0	„ Airy.

App. A. No. 2.

Inspection of Public Vaccination.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union. Minimum. £ s. d.	Range of Awards in each Union. Maximum. £ s. d.	Total Sum awarded in each Union. £ s. d.	Medi Inspec
Blandford - - -	4	2	3 12 0	5 17 0	9 9 0	Dr. Flet
Blything - - -	8	6	5 8 0	12 3 0	82 12 0	„ Airy
Bodmin - - -	7	5	4 13 0	7 12 0	30 5 0	„ Hor
Bolton - - -	9	8	2 19 0	69 10 0	261 16 0	Mr. Eva
Bosmere and Claydon -	3	2	9 18 0	14 16 0	24 14 0	Dr. Airy
Brackley - - -	4	3	2 2 0	2 19 0	7 16 0	„ Hor
Bradfield - - -	5	5	5 12 0	10 11 0	41 19 0	„ Swe
Bradford (Wilts) -	3	—	—	—	—	Mr. Roy
Bradford (Yorks) -	4	3	24 2 0	41 16 0	99 13 0	Dr. Flet
Bramley - - -	4	3	2 19 0	23 0 0	35 12 0	Do.
Bridgnorth - -	3	3	3 4 0	19 8 0	29 0 0	„ Whe
Bridlington - -	4	2	1 12 0	5 3 0	6 15 0	„ Bra
Bristol - - -	1	1	—	—	14 12 0	„ Airy.
Brixworth - - -	5	5	2 12 0	7 9 0	23 0 0	„ Hor
Bromsgrove - -	5	4	1 7 0	25 15 0	50 5 0	„ Flet
Bromyard - - -	3	1	—	—	8 4 0	„ Whe
Buntingford - -	2	2	2 12 0	5 8 0	8 0 0	Mr. Roy
Burnley - - -	7	2	1 8 0	2 9 0	3 17 0	„ Eva
Burton-on-Trent - -	8	5	7 4 0	69 18 0	141 11 0	Do.
Bury St. Edmunds -	1	1	—	—	17 14 0	Dr. Airy.
Calne - - -	1	1	—	—	12 11 0	Mr. Roy
Camberwell - -	5	2	52 4 0	77 5 0	129 9 0	Dr. Swe
Cambridge - -	1	1	—	—	45 1 0	„ Airy.
Camelford - - -	2	2	6 15 0	12 2 0	18 17 0	„ Hor
Cannock - - -	6	3	1 0 0	27 6 0	36 12 0	Mr. Eva
Carnarvon - -	4	2	4 15 0	22 3 0	26 18 0	„ Roy
Catherington - -	1	—	—	—	—	Dr. Swe
Caxton and Arrington -	4	2	5 19 0	7 6 0	13 5 0	„ Airy.
Cerne - - -	3	3	1 5 0	8 7 0	17 10 0	„ Flet
Chelsea - - -	2	2	29 6 0	68 13 0	97 19 0	„ Swe
Cheltenham - -	3	—	—	—	—	Mr. Roy
Chester-le-Street - -	4	3	10 9 0	40 12 0	67 7 0	Dr. Flet
Chesterton - -	7	5	5 11 0	9 0 0	38 10 0	„ Airy.
Chippenham - -	6	4	3 9 0	18 9 0	46 12 0	Mr. Roy
Chipping Norton -	4	4	7 8 0	18 16 0	43 9 0	Do.
Chipping Sodbury -	5	3	1 15 0	15 4 0	21 0 0	Do.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union. Minimum.	Range of Awards in each Union. Maximum.	Total Sum awarded in each Union.	Medical Inspector.
			£ s. d.	£ s. d.	£ s. d.	
Chorley	5	5	12 15 0	22 8 0	87 4 0	Mr. Evans.
Christchurch	3	1	—	—	9 3 0	Dr. Sweeting.
Church Stretton	4	4	1 4 0	4 5 0	10 8 0	„ Wheaton.
Cirencester	5	5	0 17 0	8 6 0	25 0 0	Mr. Royle.
Cleobury Mortimer	2	2	8 3 0	9 12 0	17 15 0	Dr. Wheaton.
Clitheroe	5	4	3 19 0	13 6 0	27 19 0	Mr. Evans.
Clun	4	3	3 0 0	6 0 0	13 17 0	Dr. Wheaton.
Colchester*	1	1	—	—	58 15 0	„ Copeman.
Columb, St., Major	6	3	3 17 0	7 19 0	17 10 0	„ Horne.
Conway	3	3	11 12 0	15 12 0	40 0 0	Mr. Royle.
Cookham	3	2	1 18 0	16 7 0	18 5 0	Dr. Sweeting.
Corwen	3	2	4 5 0	8 11 0	12 16 0	Mr. Royle.
Cosford	5	4	4 2 0	9 6 0	26 13 0	Dr. Airy.
Coventry	1	1	—	—	1 9 0	Do.
Cricklade and Wootton Bassett.	3	3	4 7 0	9 5 0	22 6 0	Mr. Royle.
Darlington	5	3	3 18 0	56 13 0	65 3 0	Dr. Fletcher.
Daventry	6	5	0 19 0	6 14 0	20 12 0	„ Horne.
Devizes	6	6	1 4 0	14 18 0	39 14 0	Mr. Royle.
Dewsbury	12	8	1 9 0	17 13 0	74 7 0	Dr. Fletcher.
Dolgelley	5	5	2 5 0	9 5 0	22 13 0	Mr. Royle.
Doncaster	7	4	2 3 0	34 6 0	45 5 0	Dr. Fletcher.
Dorchester	6	5	1 3 0	16 1 0	32 8 0	Do.
Dore	3		—	—	5 9 0	„ Wheaton.
Drayton	5	5	1 18 0	12 1 0	28 13 0	Do.
Driffield	8	7	2 1 0	8 0 0	26 19 0	„ BruceLow.
Droitwich	6	5	1 1 0	10 15 0	36 5 0	„ Fletcher.
Droxford	4	2	6 3 0	6 15 0	12 18 0	„ Sweeting.
Dudley	8	7	12 8 0	40 17 0	205 1 0	„ Fletcher.
Durham	5	4	15 2 0	29 3 0	74 19 0	Do.
Dursley	3	3	2 15 0	5 19 0	14 2 0	Mr. Royle.

* Inspected in 1892.

App. A. No. 2.

Inspection of Public Vaccination.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union. Minimum. £ s. d.	Range of Awards in each Union. Maximum. £ s. d.	Total Sum awarded in each Union. £ s. d.	Medic Inspect
Easington	5	3	13 7 0	40 14 0	83 16 0	Dr. Fletc
East Hampstead	4	2	5 7 0	7 3 0	12 10 0	„ Swee
Ellesmere	6	2	3 15 0	5 6 0	9 1 0	„ Whi
Ely	5	2	4 14 0	12 17 0	17 11 0	„ Airy.
Evesham	5	5	1 16 0	21 7 0	41 19 0	„ Flet
Exeter	1	1	—	—	26 15 0	„ Airy.
Falmouth	4	2	2 11 0	3 9 0	6 0 0	Dr. Horn
Fareham	4	4	1 2 0	23 10 0	36 14 0	„ Swe
Faringdon	4	3	3 8 0	8 2 0	18 0 0	Do.
Festiniog	5	3	4 9 0	13 12 0	24 10 0	Mr. Roy
Foleshill	6	2	6 6 0	15 7 0	21 13 0	Dr. Wils
Forden	4	4	5 14 0	9 7 0	28 4 0	„ Horn
Fordingbridge	2	2	9 16 0	11 2 0	20 18 0	„ Swe
Fylde, The	5	3	4 1 0	10 17 0	20 6 0	Mr. Evans
Garstang	3	2	5 10 0	7 2 0	12 12 0	Mr. Evan
Gateshead	5	2	26 17 0	121 8 0	148 5 0	Dr. Fletch
George, St., East	1	1	—	—	60 4 0	„ Sweet
Germans, St.	6	4	3 14 0	11 19 0	34 14 0	„ Horn
Gloucester	2	1	—	—	1 0 0	Mr. Royle
Goole	4	3	3 5 0	23 5 0	30 19 0	Dr. Fletch
Guisborough	7	2	6 19 0	9 3 0	16 2 0	„ Horn
Hackney	4	3	14 7 0	27 16 0	69 0 0	Dr. Sweet
Hardingstone	3	3	3 1 0	4 19 0	12 12 0	„ Horn
Hartismere	5	3	5 6 0	8 17 0	21 4 0	„ Airy.
Hartlepool	3	2	30 14 0	43 6 0	74 0 0	„ Fletch
Haslingden	6	6	6 3 0	29 18 0	107 16 0	Mr. Evan
Havant	4	3	3 4 0	8 17 0	17 6 0	Dr. Sweet

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union. Minimum.	Range of Awards in each Union. Maximum.	Total Sum awarded in each Union.	Medical Inspector.
			£ s. d.	£ s. d.	£ s. d.	
Hawarden	3	2	7 19 0	9 6 0	17 5 0	Mr. Royle.
Headington	2	2	14 3 0	80 19 0	95 2 0	Do.
Helmsley	2	—	—	—	—	Dr. Horne.
Helston	5	5	7 5 0	11 13 0	47 5 0	Do.
Hemsworth	4	4	2 0 0	15 13 0	39 17 0	„ Bruce Low.
Henley	6	3	2 10 0	16 9 0	33 14 0	Mr. Royle.
Hereford	4	4	9 9 0	40 10 0	71 12 0	Dr. Wheaton.
Hertford	5	3	3 14 0	14 17 0	23 4 0	Mr. Royle.
Highworth and Swindon	4	2	4 0 0	8 0 0	12 0 0	Do.
Hitchin	5	1	—	—	5 10 0	Do.
Holbeach	1	1	—	—	15 5 0	Dr. Fletcher.
Holywell	5	2	15 1 0	18 8 0	33 9 0	Mr. Royle.
Houghton-le-Spring	3	2	9 6 0	13 8 0	22 14 0	Dr. Fletcher.
Howden	4	2	3 6 0	3 6 0	6 12 0	„ BruceLow.
Hoxne	8	4	1 7 0	6 19 0	13 14 0	„ Airy.
Huddersfield	16	9	5 17 0	31 18 0	98 7 0	„ Fletcher.
Hungerford	5	2	1 11 0	7 10 0	9 1 0	„ Sweeting.
Hunslet	4	4	3 9 0	53 14 0	76 16 0	„ Fletcher
Huntingdon	5	5	4 15 0	12 14 0	37 11 0	„ Airy.
Ipswich	2	1	—	—	54 14 0	Dr. Airy.
Islington	5	2	57 17 0	68 13 0	126 10 0	„ Sweeting.
Ives, St.	5	3	4 16 0	7 12 0	18 10 0	„ Airy.
Keighley	4	3	0 13 0	3 10 0	5 16 0	Dr. BruceLow.
Kensington*	2	1	—	—	98 15 0	„ Sweeting.
Kettering	4	2	3 1 0	4 19 0	8 0 0	„ Horne.
Kidderminster	5	3	4 10 0	37 13 0	51 4 0	„ Fletcher.
King's Norton	7	7	1 5 0	83 5 0	188 11 0	Do.
Kington	5	5	1 2 0	8 11 0	23 10 0	„ Wheaton.
Kirkby Moorside	1	1	—	—	8 2 0	„ Horne.
Knaresborough	3	3	2 14 0	16 14 0	36 0 0	„ BruceLow.

* Inspected in 1892.

App. A. No. 2.

Inspection of Public Vaccination.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union. Minimum. £ s. d.	Range of Awards in each Union. Maximum. £ s. d.	Total Sum awarded in each Union. £ s. d.	Medical Inspector
Lambeth	5	5	14 11 0	86 19 0	277 14 0	Dr. Sweet
Lanchester	4	3	2 11 0	21 17 0	42 6 0	„ Fletch
Launceston	6	6	0 10 0	7 11 0	24 15 0	„ Horne
Ledbury	3	2	9 0 0	10 0 0	19 0 0	„ Wheat
Leeds	7	7	0 17 0	73 8 0	152 18 0	„ Airy.
Leigh	3	3	18 16 0	58 11 0	115 15 0	Mr. Evan
Leighton Buzzard	2	2	1 0 0	22 14 0	23 14 0	„ Royle
Leominster	3	3	1 12 0	18 19 0	28 17 0	Dr. Wheat
Lewisham	5	4	6 9 0	24 14 0	59 5 0	„ Sweet
Lichfield	6	3	5 3 0	33 4 0	66 14 0	Mr. Evan
Linton	3	2	7 16 0	9 5 0	17 1 0	Dr. Airy.
Liskeard	7	3	5 12 0	11 7 0	24 5 0	„ Horne
Liverpool	3	1	—	—	41 17 0	„ Airy.
Llanfyllin	5	3	5 3 0	7 14 0	18 5 0	„ Horne
Llanrwst	3	—	—	—	—	Do.
London, City of	2	2	6 18 0	11 1 0	17 19 0	„ Sweeti
Ludlow	5	4	4 6 0	7 11 0	21 3 0	„ Wheat
Luton	5	3	2 0 0	3 8 0	7 8 0	Mr. Royle
Lymington	4	2	4 14 0	8 3 0	12 17 0	Dr. Sweeti
Machynlleth	4	2	5 5 0	6 8 0	11 13 0	Dr. Horne
Madeley	4	3	5 0 0	24 12 0	38 10 0	„ Wheat
Malmesbury	4	2	1 11 0	5 11 0	7 2 0	Mr. Royle.
Malton	6	3	2 3 0	5 9 0	11 17 0	Dr. Horne
Manchester	3	3	16 12 0	36 12 0	82 8 0	„ Airy.
Marlborough	2	1	—	—	5 0 0	Mr. Royle
Martley	6	3	4 16 0	8 5 0	18 12 0	Dr. Fletch
Marylebone	2	2	59 8 0	87 1 0	146 9 0	„ Sweeti
Melksham	2	2	15 9 0	27 1 0	42 10 0	Mr. Royle
Mere	2	2	6 10 0	8 19 0	15 9 0	Do.
Meriden	3	3	1 16 0	6 2 0	12 5 0	Dr. Wilson
Middlesbrough	4	3	8 4 0	61 8 0	93 17 0	„ Horne
Mildenhall	2	1	—	—	13 16 0	„ Airy.
Mile End Old Town	2	2	36 2 0	57 18 0	94 0 0	„ Sweet
Mutford and Lothingland.	3	3	6 16 0	67 17 0	101 7 0	„ Airy.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union. Minimum.	Range of Awards in each Union. Maximum.	Total Sum awarded in each Union.	Medical Inspector.
			£ s. d.	£ s. d.	£ s. d.	
Neots, St. - -	6	5	2 3 0	11 18 0	27 6 0	Dr. Airy.
Newbury - - -	3	1	—	—	7 17 0	„ Sweeting.
Newcastle-on-Tyne -	3	4	27 8 0	65 7 0	161 3 0	„ Airy.
Newcastle-under-Lyme -	3	2	1 19 0	28 9 0	30 8 0	Mr. Evans.
Newent - - -	3	3	5 10 0	7 7 0	20 0 0	„ Royle.
Newmarket - -	8	6	6 5 0	25 19 0	65 15 0	Dr. Airy.
Newport (*Mon.*) - -	9	1*	—	—	52 4 0	„ Fletcher.
Newport (Salop) - -	4	4	5 19 0	10 4 0	34 2 0	„ Wheaton.
Newtown and Llanidloes	4	3	5 2 0	16 7 0	29 16 0	„ Horne.
Nothallerton - -	4	2	2 8 0	3 11 0	5 19 0	Do.
Northampton - -	4	2	0 5 0	0 5 0	0 10 0	Do.
Northleach -	4	5	1 6 0	5 18 0	16 16 0	Mr. Royle.
North Witchford	4	3	4 4 0	7 9 0	16 16 0	Dr. Airy.
Nuneaton - - -	2	2	4 6 0	8 10 0	12 16 0	„ Wilson.
Ormskirk - - -	6	6	9 8 0	42 16 0	131 13 0	Mr. T. W. Thompson.
Oswestry - - -	5	5	4 9 0	32 9 0	69 3 0	Dr. Wheaton.
Oundle - - -	4	1	—	—	8 4 0	„ Horne.
Ouseburn, Great - -	6	2	1 14 0	6 5 0	7 19 0	„ Fletcher.
Oxford - - -	1	1	—	—	40 9 0	Mr. Royle.
Pancras, St. - -	1	1	—	—	162 1 0	Dr. Sweeting.
Pateley Bridge - -	2	2	0 7 0	10 3 0	10 10 0	„ Fletcher.
Patrington - -	5	3	0 14 0	2 9 0	5 3 0	„ BruceLow.
Penzance - - -	5	2	9 11 0	17 6 0	26 17 0	„ Horne.
Pershore - - -	5	3	6 12 0	14 12 0	29 3 0	„ Fletcher.
Peterborough - -	7	5	3 7 0	51 14 0	90 1 0	„ Horne.
Petersfield - -	4	3	4 12 0	12 4 0	24 14 0	„ Sweeting.
Pewsey - - -	5	5	2 16 0	10 18 0	34 3 0	Mr. Royle.
Pickering - - -	3	2	2 2 0	7 17 0	9 19 0	Dr. Horne.
Plomesgate - -	6	6	3 6 0	7 6 0	34 3 0	„ Airy.
Pocklington - -	6	3	2 5 0	5 1 0	10 4 0	„ BruceLow.
Pontefract - -	7	6	2 9 0	35 8 0	97 4 0	„ Sweeting.

* Specially inspected in 1893.

App. A. No. 2.

Inspection of Public Vaccination.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union. Minimum. £ s. d.	Range of Awards in each Union. Maximum. £ s. d.	Total Sum awarded in each Union. £ s. d.	Medic Inspect
Poole	4	3	7 19 0	20 4 0	36 8 0	Dr. Fleto
Portsea Island	1	1	—	—	172 14 0	„ Swee
Potterspury	4	3	1 4 0	17 12 0	21 8 0	„ Horn
Preston	4	4	10 1 0	93 2 0	181 18 0	Mr. Evan
Pwllheli	5	4	4 0 0	9 18 0	26 8 0	„ Royl
Reading	1	1	—	—	67 18 0	Dr. Swee
Redruth	6	2	12 17 0	19 13 0	32 10 0	„ Horn
Ringwood	1	1	—	—	20 2 0	„ Swee
Ripon	4	3	2 1 0	17 8 0	22 15 0	„ Bruce
Risbridge	5	3	3 7 0	19 19 0	28 2 0	„ Airy.
Romsey	4	2	3 1 0	22 3 0	25 4 0	„ Swee
Ross	4	2	9 0 0	21 4 0	30 4 0	„ Whea
Royston	6	4	4 8 0	12 4 0	26 9 0	Mr. Royle.
Rugby	8	6	2 8 0	5 17 0	20 11 0	Dr. Wilso
Ruthin	3	—	—	—	—	„ Horn
Saddleworth	1	1	—	—	13 8 0	Dr. Brucel
Salford	4	3	8 15 0	31 16 0	65 7 0	„ Airy.
Samford	4	3	4 4 0	12 2 0	25 9 0	Do.
Scarborough	6	3	4 3 0	6 7 0	14 18 0	„ Horne.
Sculcoates	6	4	1 19 0	96 10 0	155 11 0	„ Brucel
Sedburgh	2	2	3 3 0	3 17 0	7 0 0	Do.
Sedgefield	4	3	14 14 0	16 1 0	46 11 0	„ Fletch
Selsdon	4	3	5 4 0	9 1 0	21 17 0	Mr. Evans.
Selby	4	4	1 0 0	19 19 0	29 9 0	Dr. Fletch
Shaftesbury	3	2	5 2 0	12 6 0	17 8 0	Do.
Sheffield	6	6	11 16 0	37 10 0	167 11 0	„ Airy.
Shifnal	4	3	6 9 0	9 6 0	22 6 0	„ Wheat
Shipston-on-Stour	5	5	3 18 0	13 10 0	35 18 0	„ Fletch
Skipton	8	2	3 7 0	6 15 0	10 2 0	Do.
Skirlaugh	5	1	—	—	6 1 0	„ Brucel

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union. Minimum. £ s. d.	Range of Awards in each Union. Maximum. £ s. d.	Total Sum awarded in each Union. £ s. d.	Medical Inspector.
Solihull	4	4	3 16 0	14 5 0	29 14 0	Dr. Wilson.
Southam	4	3	2 7 0	7 18 0	15 17 0	Do.
South Shields	3	2	66 6 0	81 5 0	147 11 0	„ Fletcher.
Stafford	4	4	5 4 0	21 5 0	56 12 0	Mr. Evans.
Stockbridge	2	2	9 7 0	10 2 0	19 9 0	Dr. Sweeting.
Stockton	3	2	11 4 0	37 19 0	49 3 0	„ Fletcher.
Stokesley	4	4	3 19 0	7 11 0	24 5 0	„ Horne.
Stoke-upon-Trent	5	5	14 6 0	102 2 0	245 2 0	Mr. Evans.
Stone	4	2	16 8 0	16 14 0	33 2 0	Do.
Stourbridge	7	4	6 16 0	40 6 0	91 14 0	Dr. Fletcher.
Stow	7	5	2 0 0	10 1 0	32 17 0	„ Airy.
Stow-on-the-Wold	2	1	—	—	5 9 0	Mr. Royle.
Stratford-on-Avon	7	5	2 1 0	13 1 0	29 5 0	Dr. Wilson.
Stratton	2	—	—	—	—	„ Horne.
Stroud	6	4	5 13 0	10 5 0	31 8 0	Mr. Royle.
Sturminster	4	2	5 3 0	11 4 0	16 7 0	Dr. Fletcher.
Sudbury	7	6	1 11 0	18 0 0	54 12 0	„ Airy.
Sunderland	5	4	23 4 0	37 17 0	159 7 0	„ Fletcher.
Tadcaster	5	4	0 9 0	15 11 0	34 7 0	Dr. Fletcher
Tamworth	3	2	27 11 0	28 19 0	56 10 0	Mr. Evans.
Teesdale	5	3	6 3 0	10 13 0	24 1 0	Dr. Fletcher.
Tenbury	2	1	—	—	8 16 0	Do.
Tetbury	2	1	—	—	6 4 0	Mr. Royle.
Tewkesbury	4	—	—	—	—	Do.
Thame	6	6	1 7 0	10 10 0	36 1 0	Do.
Thingoe	8	8	1 7 0	13 2 0	46 14 0	Dr. Airy.
Thirsk	6	6	1 2 0	7 10 0	13 5 0	„ Horne.
Thornbury	4	2	1 12 0	11 7 0	12 19 0	Mr. Royle.
Thorne	5	2	2 3 0	2 6 0	4 9 0	Dr. Fletcher.
Thrapston	5	1	—	—	3 14 0	„ Horne.
Tisbury	3	2	5 5 0	7 19 0	13 4 0	Mr. Royle.
Todmorden	2	2	4 2 0	10 1 0	14 3 0	Dr. Fletcher.
Towcester	4	2	4 16 0	6 1 0	10 17 0	„ Horne.
Toxteth Park	2	2	15 14 0	19 19 0	35 13 0	„ Airy.
Truro	7	4	2 8 0	11 10 0	24 7 0	„ Horne.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union. Minimum.	Range of Awards in each Union. Maximum.	Total Sum awarded in each Union.	Medica Inspect
			£ s. d.	£ s. d.	£ s. d.	
Upton-on-Severn	6	4	1 4 0	17 14 0	31 11 0	Dr. Fletc
Uttoxeter	5	2	5 1 0	5 8 0	10 9 0	Mr. Evan
Wakefield	6	4	7 7 0	51 5 0	110 15 0	Dr. Fletch
Wallingford	3	2	11 5 0	13 3 0	24 8 0	„ Sweet
Walsall	4	3	21 1 0	37 6 0	80 6 0	Mr. Evan
Wandsworth and Clapham.	8	4	11 17 0	48 4 0	111 15 0	Dr. Sweet
Wangford	2	2	10 10 0	28 13 0	39 3 0	„ Airy.
Wantage	6	6	4 7 0	10 15 0	43 17 0	„ Sweet
Ware	8	7	0 6 0	11 6 0	30 4 0	Mr. Royle.
Wareham and Purbeck	7	2	7 13 0	9 18 0	17 11 0	Dr. Fletch
Warminster	5	5	2 19 0	11 5 0	33 19 0	Mr. Royle.
Warrington	3	3	12 8 0	184 16 0	245 19 0	„ Evans.
Warwick	3	2	13 3 0	21 11 0	34 14 0	Dr. Wilson
Watford	4	3	4 5 0	17 3 0	31 1 0	Mr. Royle.
Weardale	5	4	0 13 0	8 3 0	16 11 0	Dr. Fletch
Wellingborough	5	3	0 10 0	1 12 0	2 16 0	„ Horne.
Wellington (Salop)	3	3	7 0 0	30 9 0	64 16 0	„ Wheat
Wem	4	2	6 9 0	6 11 0	13 0 0	Do.
Weobley	3	1	—	—	6 4 0	Do.
West Bromwich	5	4	28 4 0	54 14 0	170 8 0	Mr. Evans.
Westbury-on-Severn	4	4	3 13 0	11 9 0	30 2 0	„ Royle.
Westbury and Whorwelsdown.	4	4	2 19 0	15 4 0	28 5 0	Do.
West Derby	7	7	11 10 0	65 3 0	194 11 0	Dr. Airy.
Wetherby	6	1	—	—	6 8 0	„ Fletch
Weymouth	6	5	3 1 0	14 1 0	41 4 0	Do.
Wharfedale	4	2	6 3 0	16 16 0	22 19 0	Do.
Wheatenhurst	2	2	1 19 0	2 1 0	4 0 0	Mr. Royle.
Whitby	4	2	4 17 0	13 11 0	18 8 0	Dr. Horne.
Whitchurch (Salop)	3	3	1 16 0	12 17 0	23 5 0	„ Wheat
Whittlesey	2	1	—	—	2 7 0	„ Airy.
Wigan	10	4	11 1 0	73 7 0	152 2 0	Mr. Evans.
Wilton	4	3	5 10 0	11 3 0	24 10 0	„ Royle.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union. Minimum. £ s. d.	Range of Awards in each Union. Maximum. £ s. d.	Total Sum awarded in each Union. £ s. d.	Medical Inspector.
Wimborne and Cranborne.	4	2	14 1 0	18 12 0	32 13 0	Dr. Fletcher.
Winchcomb - -	2	2	5 2 0	10 11 0	15 13 0	Mr. Royle.
Windsor - - -	3	1	—	—	30 6 0	Dr. Sweeting.
Wisbeach - - -	14	6	2 3 0	16 5 0	39 14 0	„ Airy.
Witney - - -	4	2	14 0 0	19 18 0	33 18 0	Mr. Royle.
Woburn - - -	2	1	—	—	8 9 0	Do.
Wokingham - -	4	3	3 14 0	7 4 0	16 0 0	Dr. Sweeting.
Wolstanton and Burslem	3	3	50 5 0	61 12 0	168 18 0	Mr. Evans.
Wolverhampton - -	5	1	—	—	40 5 0	Do.
Woodbridge - -	4	4	4 12 0	15 6 0	44 13 0	Dr. Airy.
Woodstock - -	4	1	—	—	8 15 0	„ Royle.
Woolwich - -	4	2	24 5 0	75 8 0	99 13 0	„ Sweeting.
Worcester - -	1	1	—	—	43 6 0	„ Fletcher.
Wrexham - - -	5	4	6 3 0	43 11 0	69 19 0	„ Horne.
York - - -	6	4	2 17 0	125 16 0	140 19 0	„ BruceLow.
Total - -	1,429	992	—	—	14,286 8 0	

App. A. No. 3.

National Vaccine Establishment.

No. 3.

Statistics of the National Vaccine Establishment and Educational Vaccination Stations.

I.—Staff at end of 1893.

N.B.—The Stations named in *italics* are Educational Vaccination Stations authorised by the Local Government Board.

Description of Vaccinator.	Name of Vaccinator.	Vaccination Stations.	Days and Hours of Attendance.
Vaccinators supplying lymph for the public service and salaried from the Parliamentary grant.	1. Dr. R. Cory	*Surrey Chapel*	Tues., Thurs.; 2.
	2. Mr. Joseph Loane	*Tottenham Court Chapel.*	Mon., Wednes.; 1
Parochial and other Vaccinators not salaried from the Parliamentary grant, but contributing lymph at a fixed rate of payment.	1. Mr. Ellis S. Guest	*Manchester*	Monday; 2.
	2–6. Dr. Edmund Robinson.	*Birmingham*	Monday Tuesday } 11. Wednesday Wednesday; 2. Thursday; 11.
	7. Mr. N. E. Roberts	*Liverpool*	Tuesday; 1.
	8. Mr. E. L. Webb	*Pimlico*	Thursday; 10.
	9. Mr. J. Hawthorn	*Newcastle-on-Tyne.*	Wednesday; 3.
	10. Mr. E. L. Webb	Westminster	Tuesday; 10.
	11–12. Mr. E. C. Greenwood	*Marylebone*	Tuesday; 2. Wednesday; 10.
	13. Mr. J. Loane	*Whitechapel*	Wednesday; 11.
	14. Mr. Frederick Holmes	*Leeds*	Tuesday; 2.30.
	15. Dr. Edward Lynes	Coventry	Tuesday; 12.
	16–17. Dr. Hugh Thomson	*Glasgow*	Monday; 2. Mon., Thurs.; 12.
	18. Mr. J. F. Staines	*Endell Street*	Tuesday; 10.
	19. Mr. W. Skinner	*Sheffield*	Tuesday; 3.
	20. Dr. A. C. Clarke	Salford	Thursday; 2.
	21. Dr. G. A. Miskin	Waterloo	Tuesday; 2.
	22. Dr. J. B. Buist	*Edinburgh*	Thursday; 3.
	23. Dr. R. Cory	*St. Thomas's Hosp.*	Wednesday; 11.3
	24. Mr. Wm. McLennan	*Glasgow West*	Monday; 1.
	25. Dr. William A. Budd	*Exeter*	Thursday; 3.
Teachers of Vaccination not supplying lymph.	Dr. W. Husband	*Edinburgh*	Wednes., Sat.; 11
	Mr. H. Lawrence	*Bristol*	Wednesday; 10.
	Mr. V. A. Jaynes	*Horsleydown*	Wednesday; 3.
	Dr. A. N. Montgomery	*Dublin*	Tues., Fri.; 10.
	Dr. R. Cory	*Cambridge*	Friday; 11.

II.—Animal Vaccine Station.

The Animal Vaccine Station is at 95, Lamb's Conduit Street, where Dr. R. Cory and Mr. T. S. Stott attend for the Vaccination of Children on Tuesdays and Thursdays, at 10.30 a.m.

—Sources and Amount of Lymph Supply in 1893.

N.B.—The Stations named in *italics* are Educational Vaccination Stations authorised by the Local Government Board.

cription of cinator.	Vaccination Stations.	Number of Vaccinations performed at the Stations respectively.		Number of Charges of Lymph supplied from the Stations respectively.	
		Primary.	Re-vaccinations.	Charged Ivory Points.	Charged Tubes each estimated as equal to 10 Ivory Points.
cinators laried om the arlia- entary ant.	1. *Surrey Chapel*	163	19	1,040	—
	2. *Tottenham Court Chapel.*	319	36	—	141
	Total -	482	55	1,040	141
bchial d other accina- rs not laried om the arlia- entary rant, it con- ibuting mph at fixed te of yment.	1. *Manchester* -	924	103	—	145
	2–6. *Birmingham* -	3,817	2,350	—	1,068
	7. *Liverpool* -	490	86	—	118
	8. *Pimlico* - -	358	21	—	5
	9 *Newcastle-on-Tyne.*	536	18	—	141
	10. Westminster -	537	25	—	5
	11–12. *Marylebone*	1,039	347	—	37
	13. *Whitechapel* -	2,038	—	—	624
	14. *Leeds* - -	697	5	—	—
	15. Coventry -	45	9	—	—
	16–17. *Glasgow* -	1,240	38	—	48
	18. *Endell Street* -	204	20	—	105
	19. *Sheffield* - -	649	5	—	—
	20. Salford - -	296	11	—	—
	21. Waterloo -	1,407	1	—	2,103
	22. *Edinburgh* -	425	16	—	—
	23. *St. Thomas's Hospital.*	211	12	—	—
	24. *Glasgow West* -	574	50	—	14
	25. *Exeter** - -	180	10	—	7
	Total -	15,667	3,127	—	4,415
	Grand Total -	16,149	3,182	1,040	4,556

* For seven months only.

App. A. No. 3.

National Vaccine Establishment

III.—Sources and Amount of Lymph—*continued.*

During the year, additional supplies (to the extent of 3,274 charged tubes) were obtained from the following gentlemen:—

Dr. T. N. Orchard, Pendleton.
Mr. J. Bark, Kirkdale.
Dr. F. Cadell, Edinburgh.
Mr. A. Meeson, Toxteth Park.
Dr. R. F. Cook, Gateshead.
Dr. G. A. Miskin, Kennington.
Mr. H. E. Hackett, Gorton.

IV.—Distribution of Human Lymph, 1893.

Number of applications:

From Medical Practitioners in England and Wales	4,071
„ „ „ Scotland	157
„ the Army	1
„ the Navy and from the Emigration Department	39
„ India and the Colonies	36
„ Diplomatic and other Foreign Services	18
Supplies sent out:—	
Charged ivory points	1,020
„ capillary tubes	6,787

V.—Distribution of Calf-Lymph, 1893.

Number of applications	2,797
Supplies received:—	
Charged ivory points	18,961
„ capillary tubes	76
Supplies sent out:—	
Charged ivory points	16,176
„ capillary tubes	

No. 4.

REPORT on the OPERATIONS of the ANIMAL VACCINE STATION at LAMB'S CONDUIT STREET during the year 1893–94; by DR. CORY.

During the year 1st April, 1893 to 31st March, 1894, 276 calves were received at Lamb's Conduit Street. Of these (males 194, females 82) were vaccinated for the purposes, of the station, other four were rejected as unfit for vaccination purposes. The aggregate weight on reception at Lamb's Conduit Street of the 276 calves was, males 56,365 lbs., females 24,941 lbs. On dismissal from the station their weights were respectively, males 61,039 lbs., females, 27,013 lbs., so that during retention for vaccination purposes calves of both sexes gained considerably in weight males by an average of 24·09 lbs., females by an average of 25·27 lbs.

Of the above calves, 264 were vaccinated with lymph directly derived from other calves, and 12 were vaccinated with calf lymph which had been stored. As usual, vaccinations performed with stored lymph proved much less successful than the others; 19,997 insertions in 264 calf to calf operations produced 18,596 vesicles, or 93·00 per cent.; and 690 in 12 stored lymph operations produced 535 vesicles, or 77·54 per cent. No material difference in the result of calf to calf vaccinations was observed whether the lymph used was from calves vaccinated 72, 96, or 120 hours previously; irrespective of interval in the above sense, the rate of insertion success was practically 93 per cent. The average temperature taken in the rectum of the 82 female calves was 102·39 before vaccination, and 103·00 five days after vaccination. The average temperature of the 194 males before vaccination was 102·58, and 103·34 five days after vaccination.

Primary Vaccinations.—During the year 7,693 persons received primary vaccinations at the station, five separate insertions of lymph being made in each instance. Of these persons, 3,897 were male, 3,796 females. All but 54 of the 7,590 primary vaccinations which returned for inspection succeeded at the first attempt and in no case was a third attempt at vaccination requisite. The amount of insertion success obtained by each of three several operators was as follows. Of 17 persons primarily vaccinated by Mr. Stott, one failed to return for inspection. Of the remaining 16, nine were, on examination, found to have taken in five places, one in four, four in three, one in two, one in one. Of 991 persons primarily vaccinated by Dr. Savory, acting for Mr. Stott or myself in the absence of one or other of us, 15 failed to return for inspection, and two were vaccinated for the cure of nævi. Of the 974 remaining, 816 were found to have taken in five places, 56 in four, 34 in three, 19 in two, 32 in one, and 17 failed on the first attempt. Dr. Savory's success therefore was 91·91 per cent. Of 6,685 persons primarily vaccinated by myself, 87 who failed to return for inspection and other 29 are not taken into account in these statistics.* Of the 6,569 remaining, 5,942 were found to have taken in five places, 312 in four, 139 in three, 74 in two, 65 in one only, while in 37 cases vaccination proved unsuccessful on the first trial, an insertion success rate of 96·17 per cent.

Re-vaccinations.—These during the year numbered 598. Mr. Stott performed 7, Dr. Savory 45, and I myself 546. Of these latter 407 were successful in five places, 48 in four, 11 in three, 4 in two, 11 in one

* Of these 29, 11 were operated on for the cure of nævi; and of the 18 remaining 4 were infants vaccinated with lymph taken at a very early stage of the calf-vesicle, and 14 were infants vaccinated with stored calf-lymph from French or outside sources.

and 20 were unsuccessful. Other 45 did not return for inspection. My insertion success rate therefore in revaccinations was 90·98 per cent. and Dr. Savory's 93·49 per cent.

In all 74 cases returned to the station after "inspection" on account of some abnormal course of their vaccinations. In the vast majority of cases the abnormality consisted of sore arm, referable almost always to ignorant treatment of the vesicles or of the scab, in spite of the printed directions on the backs of the cards that are given to the persons in charge of each infant vaccinated. For the rest there were six cases of transient eruption, four cases of axillary abscess following sore arm, and six cases of erysipelas also complicating sore arm.

Two deaths were heard of as occurring shortly after vaccination. Elsie L. G—, who was vaccinated on the 4th July, is said to have died on the 24th July of exhaustion followed by convulsion. Arthur V. F—, who was vaccinated on the 17th October, 1893, died of erysipelas on the 7th November, 1893.

No. 5.

ABSTRACT of MEDICAL INSPECTIONS made in 1893 with regard to the INCIDENCE of DISEASE on particular places, and to questions concerning LOCAL SANITARY ADMINISTRATION.

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1. ALTON REGISTRATION DISTRICT (SOUTHANTS); population (1891), 15,146; Dr. Deane Sweeting.

Sanitary Authorites: Alton U. and R.*

Ground of Inquiry: Diphtheria. Registrar-General's Returns.

Chief Facts reported by Inspector: ALTON U.—There were 14 cases of diphtheria notified between April 29th and May 8th, of which eight proved fatal. Four families invaded, in three of which infection was directly, in the other indirectly, referable to Chawton, in the rural district of Alton. Spread entirely by personal means No connexion with insanitary circumstances. Suspicious deaths from variously termed throat affections in Alton in previous years. Hospital provision altogether unsatisfactory and inadequate.

ALTON R.—There were 45 cases of diphtheria notified from April 1st to July 28th, of which 12 proved fatal. Confined chiefly to Chawton parish, and extended thence to five other parishes. Many minor cases of sore throat bridging over incidence of notified diphtheria. Origin of first case at Chawton not determinable. Disease spread chiefly by school assemblage. Chawton school found defective in ventilation and in excrement disposal. No definite connexion with insanitary surroundings; but water supply inadequate, and excrement removal imperfect throughout the district. School closure resorted to; but tardily at first. No proper hospital provision. A farmhouse extemporised as a hospital.

2. AMLWCH (ANGLESEY); population (estimated), 2,500; Mr. E. Evans.

Sanitary Authority: Anglesey R.

Ground of Inquiry: Enteric fever. Registrar-General's Returns.

Chief Facts reported by Inspector: Localised outbreak of enteric fever occurring during first four months of the year on the outskirts of the town at Amlwch Port. Disease spread from an imported case amongst attendants and visitors in the absence of proper nursing, isolation, and disinfection. No common water, milk or food supply, and no drainage.

Water supply of town from unprotected dip wells at an unreasonable distance from dwellings. No proper system of sewerage. District entirely neglected by Sanitary Authority.

3. ASHTON-IN-MAKERFIELD (LANCASHIRE); population (1891), 13,379; Dr. Wheaton.

Sanitary Authority: Ashton-in-Makerfield U.

Ground of Inquiry: Prevelance of "fever." Reports of Medical Officer of Health.

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* Throughout this abstract "U." denotes "Urban Sanitary Authority," and "R." Rural Sanitary Authority."

Chief Facts reported by Inspector: The "fever" in question found to be for the most part enteric fever, although it was impossible to exclude the presence of a few cases of typhus fever. The enteric fever outbreak due in all probability to specific contamination of the soil around houses by defective house drains, which, together with personal infection, accounted for the peculiar limitation of the fever to certain localities. Hospital provision, available and made use of to a certain extent. Water supply subject to pollution up to 30th July 1892 from the use of privy manure on the gathering ground in the neighbourhood of the reservoir. Sewers, very defective, containing a large amount of deposit, and in some instances "blocked." Condition of houses, in places very unwholesome, deficient privy accommodation.

4. Atherstone (Warwick); population (1891), 4,991; Dr. Wheaton.

Sanitary Authority: Atherstone R.

Ground of Inquiry: Enteric fever outbreak. Report of Medical Officer of Health.

Chief Facts reported by Inspector: Outbreak of enteric fever, almost entirely confined to a limited area in the town of Atherstone. Outbreak not due to excrement disposal, sewerage, drainage, or milk supply; but to the introduction nightly into the town water mains for a period of eight weeks of an extraneous water supply, which was subject to pollution. The localisation of the fever outbreak explained by the peculiar distribution of the water mains, owing to which the suspected water was almost entirely consumed within the area to which the fever in question was almost entirely confined. The subsequent prevalence and extension of the disease in part due to infection from privy middens, also to contamination of water supply by residue of suspected water remaining in the mains, and continued consumption of the same water, which was obtained from a public tap.

5. Breedy Butts Farm; (Lancashire); Dr. Maclean Wilson.

Sanitary Authority: Fylde R.

Ground of Inquiry: Diphtheria. Report of Medical Officer of Health.

Chief Facts reported by Inspector: Household of 13 persons: 10 attacked by diphtheria; 7 died. Those first attacked attended school where sore throats were prevalent amongst scholars, some of which had been diphtheritic. Insanitary state of premises. No evidence of lower animals suffering.

6. Brent River (Middlesex); Dr. Copeman.

Sanitary Authorities: (Middlesex, portion only of river surveyed.) Brentford R.; Ealing U.; Hanwell R.; Hendon R.; Willesden U.

Ground of Inquiry: Foul condition of river bed. Complaints from private residents.

Chief Facts reported by Inspector: Water from normal source of river diverted by Regent's Canal Company. Effluent from Willesden sewage farm therefore practically forms source of river at present time; other large farms also discharge effluent

into lower reaches of river. Where river passes below Grand Junction Canal are vast heaps of London refuse, drainage from which passes into Brent. Some houses and manufacturing premises also drain to river.

Bed of river has been torn up by sudden discharge of water from "Welsh Harp" when sluices are opened, and putrescible matter has collected in considerable quantity in pits thus formed at various points.

7. BROWNHILLS U.S.D. (STAFFORDSHIRE); population (1891), 13,703; Mr. T. W. Thompson.

Sanitary Authority: Brownhills U.

Ground of Inquiry: To ascertain the action taken by the Urban Sanitary Authority for improving the general sanitary condition of the district, since Mr. Thompson's previous inspection in 1892.

Chief Facts reported by Inspector as to recent action by the Urban Sanitary Authority:—Comprehensive scheme on foot for sewering the localities of Walsall Wood, Shelfield, High Heath, and Clayhanger. Considerable improvement in eave-spouting of dwellings. Some improvement in privy and ash-pit accommodation, and apparently also in scavenging. Water of the South Staffordshire Water Works Company laid on to 128 additional houses and two schools, but beyond this no important improvement in the water supply of the district yet effected. Some action taken with a view to securing the extension of the company's mains to Walsall Wood but so far without success, though the hope is entertained that such extension will be carried out in the near future. The Infectious Disease (Notification) Act, 1889, adopted, and land purchased for purpose of an isolation hospital. General sanitary administration apparently of a more active character.

8. CHESTER-LE-STREET (DURHAM); population (1891), 4,864; Dr. Maclean Wilson.

Sanitary Authority: Chester-le-Street R.

Ground of Inquiry: Enteric Fever. Report of Medical Officer of Health.

Chief Facts reported by Inspector: Sudden outbreak of enteric fever, followed after a short interval by another equally sudden. Sufferers in both almost entirely persons using one public water supply, which at the commencement of both outbreaks was contaminated by enteric fever discharges passing into the stream forming the source of supply, and which was imperfectly filtered. In several cases infection spread by insanitary surroundings.

9. DERRY HILL (WILTS); population (estimated), 1,000; Dr. Horne.

Sanitary Authorities: Calne R. and Chippenham R.

Ground of Inquiry: Diphtheria. Local complaints.

Chief Facts reported by Inspector: Prevalence of diphtheria for some years in the locality. No data showing to what extent until 1890, in which year both Sanitary Authorities adopted the Infectious Disease (Notification) Act. Succession of cases broken apparently only by short intervals from

autumn 1890 to spring of 1893. Evidence of concurrent throat illness. Incidence of attack markedly on children, especially of school-going age. Absence of data corroborative of local views attributing the disease to unwholesome conditions. Evidence pointing to children having suffered from diphtheria in mild and unrecognised form whilst regularly attending school. Absence of any sewerage system. Crude and insanitary methods of excrement and dust removal. Water supply open to suspicion.

10. Great Tey (Essex); population (1891), 661; Dr. Copeman.

Sanitary Authority: Lexden and Winstree R.

Ground of Inquiry: Diphtheria. Local complaints.

Chief Facts reported by Inspector:—Disease introduced to village probably from neighbouring district where for years past diphtheria has been endemic, with subsequent extensive spread in virulent form on the virgin soil afforded by the inhabitants; no record of previous appearance of the disease here having been available. Diphtheria as such apparently preceded by cases of anomalous throat illness. School attendance evidently a factor in the spread of disease. No hospital provision available in district. Water supply derived mainly from surface ponds in clay soil. Sewer in the "street" about 100 yards long, near mouth of which it is joined by open ditch which receives drainage of privies and household slops, &c., from considerable portion of village. Dwellings generally damp and in bad repair.

11. Hinckley Urban and Rural Sanitary Districts (Leicester): population (1891), 20,699; Dr. Wheaton.

Sanitary Authorities: Hinckley U. and R.

Ground of Inquiry: Diphtheria. Registrar-General's Returns.

Chief Facts reported by Inspector: Hinckley U.:—Outbreak of diphtheria commencing in September 1893, preceded by prevalence of measles with throat complications in 1892, and scarlet fever with throat complications in 1893. The origin of the outbreak could not be attributed to any specially insanitary conditions. The spread of the diphtheria due to personal infection, especially through attendance at schools. Co-existing prevalence of certain affections of the throat, nose, and mouth. Absence of isolation provision, disinfection, and notification of infectious disease. Sewers, very defective in many instances containing a large quantity of deposit. House drainage defective. Excrement disposal, principally by privy middens; unwholesome dwellings; absence of supervision of slaughter-houses, dairies, and bakehouses.

Hinckley R.—Outbreaks of diphtheria in the villages of Stony Stanton, Stoke Golding, Earl Shilton, and Burbage. In the case of Stony Stanton (population 1,220) the disease appeared early in 1893, and was preceded by measles and scarlet fever with throat complications in the latter part of 1892, and beginning of 1893. The spread of the disease in Stony Stanton due to personal infection, chiefly through attendance at the village school. The disease at Stoke Golding (population, 619), Earl Shilton (population, 2,594), and Burbage (population, 1,896), appeared to have been

introduced by infection contracted at fairs; and to have spread by personal contagion. Affections of the throat, mouth, and nose, similar to those found to prevail in the Hinckley Urban Sanitary District, existed among children in the villages in which diphtheria had appeared; but appeared to be absent in the other villages in the district with one exception, that of Higham. Absence of isolation provision. Water-supply from wells, with the exception of Stony Stanton; part of which village is supplied with water from a quarry which is filtered before distribution. Excrement disposal effected by midden privies. Sewage discharged into watercourses. House drainage defective in the villages of Wolvey, Sharnford, and Higham, in which villages also there are many unwholesome dwellings.

12. Leyton (Essex); population (estimated), 63,000; Dr. Deane Sweeting.

Sanitary Authority: Leyton U.

Ground of Inquiry: Alleged Milk-Scarlatina. Report of the Leyton Urban Sanitary Authority.

Chief Facts reported by Inspector: Rise of notifications of scarlatina early in September, after sustained prevalence of the disease. Disproportionate incidence on customers of a particular dairy in Leyton. Seven cases of scarlatina just previously at a farm at Ongar supplying this Leyton dairy; alleged "Bovine Scarlatina" amongst the cows there. This latter denied, and conflicting veterinary certificates given. Milk from the Ongar farm stopped by the Leyton Sanitary Inspector from September 7th until the end of October; but scarlatina continued to be notified in the Leyton Urban Sanitary District. The Leyton Dairy found to be supplied from four other farms besides Ongar: no scarlatina known at these other farms. Speciality of distribution of milk from any of these five farms over any part of the area supplied by the dairy not determinable. Hence, impossible to correlate the increased incidence of early September with milk from the particular Ongar farm. All precautions against infection of milk taken at this farm during the prevalence of scarlatina. The Leyton dairy clean and well-arranged.

13. Pirbright, Normandy, Stoke (Extra-Urban), and Merrow (Surrey); Dr. Horne.

Sanitary Authorities: Guildford R. and Farnham R.

Ground of Inquiry: Diphtheria. Registrar-General's Returns.

Chief Facts reported by Inspector: Pirbright and Normandy:—Two separate outbreaks at Pirbright. Introduction of infection from London. Further and separate infection of district from Normandy. Spread of the disease by personal infection in both outbreaks.

Very general prevalence of "bad throats" antecedent to, and concurrently with, the first recognised case of diphtheria at Normandy. "Bad throats" frequent sequelæ of measles. Spread of diphtheria by personal infection both among children attending school and to adults in relation with infected households.

Stoke (Extra-Urban) and Merrow:—Greater incidence of diphtheria on extra-urban Stoke than upon Merrow. "School influence" concerned in the dissemination of diphtheria. Stoke Hill school chiefly concerned during January. Closure followed by almost complete cessation of invasion of houses sending children to it. Re-opening possibly responsible for spread of disease during March, April, and May. Serious development of diphtheria in July among children having relation with Stoughton Board School. Closure of schools followed by marked decadence of diphtheria extension. Limitation of spread of disease so long as school with a comparatively small attendance was implicated. Corresponding increase of disease when school with larger attendance became involved. Absence of house-to-house inquiries in vicinity of infected houses. Isolation practised in suitable cases. Disinfection of premises and clothing carried out. No methodical examination of children on re-assembly of scholars.

14. Pocklington (Yorks, E.R.); population (1891), 2,577; Mr. Evans.

Sanitary Authority: Pocklington U.

Ground of Inquiry: Enteric fever. Registrar-General's Returns.

Chief Facts reported by Inspector: Forty-three families invaded by enteric fever between April and October 1893; 63 cases and 11 deaths. Water-supply chiefly from shallow wells in the town; households using public supply from source outside the town also invaded. Fouling of air and soil by defective sewers, untrapped drains in direct connexion with interior of dwellings, "cesspools," and leaky privy middens in confined backyards. Infected excreta mixed with chloride of lime and deposited in middens, drains, and "beck." No isolation hospital; no disinfecting apparatus. House refuse not removed by Authority.

15. Poole (Dorset); population (1891), 15,438; Dr. Bulstrode.

Sanitary Authority: Poole U.

Grounds of Inquiry: Complaints as to general unsanitary condition.

Chief Facts reported by Inspector: Water-supply apparently pure, but has a tendency to act on iron service pipes. No proper sewerage system for any part of district, but a scheme under consideration of authority for sewering by sections. Present means of excrement disposal by means of huge privy vaults, which are but rarely emptied, and which, in many instances in the parish of St. James', are in very dangerous positions. Privy accommodation very deficient. Isolation accommodation defective. No disinfecting apparatus. Bye-laws obsolete. Administration inefficient.

16. Risca (Monmouth); population (1891), 7,742; Dr. Fletcher.

Sanitary Authority: Risca U.

Grounds of Inquiry: Unsatisfactory reports of Medical Officer of Health and inactivity of the Sanitary Authority.

Chief Facts reported by Inspector: Want of sufficient house accommodation. No properly distributed water-supply. No systematic sewerage, and, as a consequence, considerable pollu-

tion of watercourses. Drainage of domestic premises almost non-existent. Excrement disposal unsatisfactory, and scavenging (not undertaken by the Sanitary Authority) inefficient. Compulsory notification not in force; Infectious Disease (Prevention) Act, 1890, and Public Health Acts Amendment Act, 1890, not adopted. No isolation hospital, and no efficient disinfecting apparatus. Byelaws with respect to cleansing of footways and pavements, removal of house refuse, cleansing of earth-closets, privies, ash-pits, and cesspools, &c., in force, but not observed, and not enforced by Sanitary Authority.

7. Rotherhithe, the Parish of St. Mary; population (1891), 39,255; Dr. Theodore Thomson.

Sanitary Authority: Rotherhithe Vestry.

Ground of Inquiry: Insufficiency of Sanitary Inspectors—complaint by London County Council.

Chief Facts reported by Inspector: Many dwellings defective in construction or in bad repair. Spaces around dwellings for the most part sufficient. A considerable proportion of yards badly paved or unpaved. House and yard drainage frequently defective. Watercloset basins often of bad patterns and not provided with proper flushing apparatus. Disposal and removal of house refuse fairly good. Nuisances abound throughout the district. Sanitary staff at date of inspection consisted of a Medical Officer of Health, one Sanitary Inspector, permanently appointed, two Assistant Sanitary Inspectors temporarily appointed, and a clerk. Byelaws and regulations made by the Vestry as regards nuisances, keeping of animals, paving of yards, cleanliness of receptacles for water storage, and waterclosets.

8. Ryedale (Yorks, N.R.); Dr. Bruce Low.

Sanitary Authorities: Helmsley R., Kirkbymoorside R., Malton U. and R.

Ground of Inquiry: Outbreak of enteric fever reported by Medical Officers of Health, and local complaints as to water-supply.

Chief Facts reported by Inspector: Nunnington; population (1891), 354; and Ness; population (1891), 95. Water-supply of both villages drawn from the River Rye, which is largely polluted by the sewage of Helmsley, and by the washings from land on which local privy "muck" and Leeds town manure are spread from time to time. Outbreak cut short by all water used for domestic purposes being boiled. New water-supply needed for both villages.

Butterwick; population (1891), 69; and Brawby; population (1891), 148. Outbreak attributed to use of drinking water taken from the River Rye, which is largely polluted by human excrement. These two villages (along with the two others which were also attacked by fever at the same time mentioned above) are situated on the banks of the Rye. The outbreak in the villages occurred within three weeks after a heavy flood. Such floods known in the locality to wash down accumulations of filth deposited on the river's banks, or in the beds of such tributaries as the Boro' Beck. New water-supply required for both villages.

Helmsley, population (1891), 1,508. — The crude se
Helmsley is discharged direct into the Rye or into its t
the Boro' Beck. Solid matters, containing excrem
deposited in the channel of the Boro' Beck, and rema
till they are swept into the Rye by heavy rainfall. I
is only six miles from Nunnington, the first of the
involved in the fever outbreak.

Malton, population (1891), 4,910.—Public water supply
from a well close to banks of River Derwent, into w
Rye empties four miles higher up. In times of fl
Derwent rises rapidly and overflows its banks, occ
reaching the town's well, the water in which then
thick and discoloured. Complaints at such times h
made by householders regarding the muddy characte
water supplied to them. Serious outbreaks of diarrh
been noticed to follow the use of this muddy water.
fever has persisted in Malton for the last 20 years
The present public water supply of Malton is unsat
owing to its liability to pollution.

19. Shildon and East Thickley (Durham); population
9,537; Dr. Bruce Low.

Sanitary Authority: Shildon and East Thickley U.

Ground of Inquiry: Enteric fever. Report by Medical
of Health.

Chief Facts reported by Inspector: Scattered imported
enteric fever during May, June, and July 1893 foll
considerable outburst of the disease in August and Se
cases gradually diminishing in October and Novembe
earlier cases were mild, anomalous, and irregular, t
cases typical and severe. Many cases admittedly
notification and established foci of infection. Lower
of district suffered severely; higher portion suffer
siderably less in amount. Ventilation of sewers in low
very deficient; roadway grids purposely blocked up. I
openings provided. Complaints during summer of ba
from yard gullies. Large, deep, uncovered midden pi
yards; upon these specific excreta were thrown undisi
Large share in diffusion of disease attributed to particu
service. In the milk-seller's house there occurred
four unnotified cases believed to have been enteric feve
dairy where the milk was stored communicated direc
the sewer, without a bend or trap, by means of a 4-in
in the sinkstone. History of flooding of milkman's c
sewage on two occasions in July after heavy rainfall.
Regulations under Dairies, Cowsheds, and Milkshops
adopted by Sanitary Authority, but not enforced; no p
of hospital accommodation for infectious diseases;
proper means for thorough disinfecting of b
clothing, &c.
No evidence met with incriminating the public water su
Shildon.

20. Tenbury (Worcester); population (1891), 1,325; Dr. Ai
Sanitary Authority: Tenbury R.

Ground of Inquiry: Representation from County Cou
Worcestershire as to polluted state of Tenbury water su

Chief Facts reported by Inspector: Town liable to be flooded from River Teme. Sewers liable to regurgitation in time of flood; discharge direct into River Teme. Water from wells, mostly shallow, sunk in porous gravel bed, polluted by leakage from cess-pits. Need of scavenging by Sanitary Authority.

Dr. Frankland's analysis of Tenbury water.—"Simply sewage "which has soaked through a few feet of porous soil."

1. Thorpe St. Andrew (Norfolk); population (1891), 1,317 (2,096 with inmates and officials of County Asylum); Dr. Copeman.

Sanitary Authority: Blofield R.

Ground of Inquiry: Sanitary condition of the village and of the "Old River." Representation by the Norfolk County Council.

Chief Facts reported by Inspector: Large proportion of houses of the cottage class. Overcrowding of dwellings; dampness of walls and foundations; want of proper surface drainage. Some houses built "back-to-back," or against rising ground.

Water supply from surface wells, and of bad quality. Cesspools not properly built or ventilated; overflows from some parts into river. No system of sewerage. Nuisance from large privy middens.

Various forms of infectious illness prevalent, but no hospital accommodation provided in district. Thorpe "Old River" silted up with accumulations of mud, derived in part from surface washings, and in part from sewage matter from Norwich, and overflows of cesspools, &c., from Thorpe.

2. Trent River; Dr. Bruce Low.

The Trent polluted almost at its source by sewage of pottery district of Staffordshire; lower down by the discharge into it of sewage, more or less untreated, from many large towns and populous districts in the counties of Stafford, Leicester, Derby, Notts, and Lincolnshire. The catchment area of the Trent further polluted by the spreading upon land of large quantities of privy midden refuse brought by rail or by river from towns such as Sheffield, Nottingham, and Lincoln. The river water directly contaminated by the excreta of persons on board barges and boats sailing on the Trent. Some populations use Trent water for drinking purposes on the lower and more polluted part of it.

Sanitary Authority: Gainsborough R., population (1891), 18,756.

Ground of Inquiry: Undue prevalence of enteric fever in riverside villages. Annual Report of the Medical Officer of Health.

Chief Facts reported by Inspector: Undue prevalence of enteric fever in eight Trentside villages whose main water supply is taken from the river a few miles below the town of Gainsborough, population (1891), 14,372, whose raw sewage is discharged direct into the Trent which is here a tidal river. Other villages not using Trent water almost entirely escaped attacks of fever during last few years.

Sanitary Authority: Newark U.; population (1891), 14,457.

Ground of Inquiry: Prevalence of enteric fever in the borough for some years. Annual Report of Medical Officer of Health.

Chief Facts reported by Inspector: Public water supply till recently consisted of water drawn from wells sunk in gravel adjoining the river. Supply inadequate, and of late years has been augmented by addition of water taken direct from the Trent and supplied to the town unfiltered. For some years enteric fever present in the town and often epidemic. Under advice of Medical Officer of Health a new supply obtained from New Red Sandstone: its use was commenced in July 1893.

Sanitary Authority: Thorne R.; population (1891), 11,802.

Ground of Inquiry: Unsatisfactory water supplies of whole district. Medical Officer of Health's annual reports.

Chief Facts reported by Inspector: Town of Thorne and some villages drink water from the canal which joins the Trent at Keadby, a few miles distant, two villages use Trent water, one village drinks water from the Dutch river, a tidal stream—all of which sources are polluted by human excrement, &c. Other villages have surface wells, or collect rainwater in cisterns; these sources are also liable to pollution from their proximity to privies, middens, pigsties, &c. Urgent need for new sources of water supply throughout the district.

23. Usk (Monmouth); population (1891), 1,417; Dr. Horne.

Sanitary Authority: Usk U.

Ground of Inquiry: Diphtheria. Registrar-General's Returns.

Chief Facts reported by Inspector: Water supply for the most part bad. Waterworks Company's water supplied to small minority of houses. Defective dwellings and some overcrowding of inmates. Absence of provision for flushing and ventilation of sewers. Unsatisfactory manner of dealing with sewage. Methods of excrement and refuse disposal defective. Impossibility of ascertaining extent of diphtheria prevalence. Infectious Disease (Notification) Act not in force. Sporadic cases of diphtheria in neighbourhood for some time. Inter-communication with infected contiguous district indicated as probable source of infection of Usk. "School influence" prominent as spreading and maintaining the disease. No disinfection of premises or clothing by Sanitary Authority. Absence of provision for isolation.

24. Uxbridge (Middlesex); population (1891), 14,439; Mr. E. Evans.

Sanitary Authority: Uxbridge R.

Ground of Inquiry: Local complaints concerning pollution of stream at Eastcote, and the want of drainage at Hayes.

Chief Facts reported by Inspector: Pollution of stream at Eastcote, and of the Frays River and the River Colne at Cowley, Yiewsley, and West Drayton. A large number of dwellings dilapidated, and many unfit for habitation. Sewers at Harefield and Colham Green unventilated, and want of proper system of sewerage throughout remainder of district. Water supply deficient in portions of Ickenham, Ruislip, and Northolt, and chiefly obtained from shallow wells and streams exposed to contamination at Cowley, Yiewsley, Hayes, and West Drayton. Gross nuisances from porous cesspits and

accumulations of refuse, the removal of which is not enforced by the Authority in accordance with their byelaws.

25. Whitby (Yorks, N.R.); population (1891), 13,106; Dr. Wilson.

Sanitary Authority: Whitby U.

Ground of Inquiry: General sanitary circumstances. Reports of Medical Officer of Health.

Chief Facts reported by Inspector: Many dwellings old and dilapidated. Sewerage modern. Sewers ventilated and flushed. Narrow yards on east side of old town have surface channel drainage. Most houses have pail closets, ashes put into the pails. Public water supply good but not constant. Contaminated wells still in use. Slaughter-houses and cowsheds insanitary. No isolation hospital except a wooden erection with two beds. Sewerage of Ruswarp defective. No systematic inspection by Medical Officer of Health. Reports meagre. Inspector of Nuisances has too much work.

26. Whitby Rural Sanitary District (Yorks, N.R.); population (1891), 9306; Dr. Maclean Wilson.

Sanitary Authority: Whitby R.

Ground of Inquiry: Arrangements for discharge of duties of Medical Officer of Health.

Chief Facts reported by Inspector: Defects in sanitation at the various villages; many of these not dealt with by Medical Officer of Health or Authority. Systematic inspection not made. Many houses unfit for habitation. New sewers required. Many houses without privies. Farm middens and village ponds are causes of nuisance. Water supply deficient in nearly every village. Byelaws and regulations required. Isolation hospital much needed.

27. Worthing, Borough of (Sussex); population (1891), 16,722; and the villages of Broadwater and West Tarring; Dr. Theodore Thomson.

Sanitary Authorities: Worthing Town Council, and East Preston R.

Ground of Inquiry: Epidemic of Enteric Fever.—Report of Medical Officer of Health.

Chief Facts reported by Inspector: In 1893 enteric fever cases to the number of 1,317 are known to have occurred in the Borough of Worthing, and 168 deaths were attributed to this disease. Of the 1,317 cases, 1,257 were in the part of the borough known as "Worthing," while 58 were in the remainder of the borough known as "West Worthing." Two neighbouring villages, viz., West Tarring and Broadwater (both in the East Preston Rural Sanitary District), also invaded by the fever, 55 cases and 9 deaths in the former and 41 cases and 9 deaths in the latter. In "Worthing" and Broadwater the epidemic occurred chiefly from May to mid-July, in "West Worthing" and West Tarring from mid-July to late August. Localisation of the fever in certain parts of "West Worthing" and West Tarring; but no localisation of the fever in "Worthing" and Broadwater. "Worthing" and Broadwater have a common water-supply; "West Worthing" and West

Tarring have a separate supply common to both. "West Worthing" has a separate sewerage system; "Worthing" and West Tarring have a sewerage system common to both; Broadwater has no system of sewerage. The epidemic was not referable to general sanitary circumstances, to sewerage or drainage, or to milk supply. The epidemic in "Worthing" and Broadwater was closely related in point of time to employment of a new source of water-supply; the disease was general throughout and limited to areas that received this water; in these areas incidence of the fever was almost wholly on houses supplied with this water, and this new source of supply was found to be open to dangerous contamination, shown by bacteriological examination to have occurred. The epidemic in "West Worthing" and West Tarring was probably referable to local infection of water mains.

28. Ystradyfodwg (Glamorgan); population (1891), 88,350; Dr. Bruce Low.

Sanitary Authority: Ystradyfodwg U.

Ground of Inquiry: Representations from Glamorganshire County Council under the Local Government (England and Wales) Act, 1888, to the effect that the Sanitary Authority had not properly enforced the Public Health Acts.

Chief Facts reported by Inspector: Administration until recently had been lax. Grave nuisances had been allowed to remain unabated. Serious fouling of the Rhondda rivers from excrement and other refuse deposited on the banks. Bye-laws in the past not properly enforced. Some prevalence of enteric fever in certain parts of district due in one case to a polluted water supply, in others to filth accumulations near dwellings. Hospital provision for infectious diseases inadequate. Of late, Sanitary Authority have shown commendable activity. In conjunction with the adjoining district of Pontypridd, they have provided a main sewer outfall to the sea, a distance of 17½ miles, at a cost of 156,000*l.* They are now constructing subsidiary sewers in the district to prevent fouling of the rivers, at a cost of 50,000*l.* They have appointed a new chief inspector who has five assistant inspectors under him, and these are making systematic house-to-house visits. All the objectionable vault privies are being transformed into w.cs. Since the inspection, the Sanitary Authority have adopted the Infectious Disease (Notification) Act, 1889, the Infectious Disease (Prevention) Act, 1890, and the Public Health Acts Amendment Act, 1890. The byelaws are now being enforced. The district which is peculiarly situated in two deep narrow valleys, and populated almost entirely by colliers, presents considerable difficulties in dealing with refuse, &c. General improvement is now taking place, and the Sanitary Authority are displaying more activity in their administration, under the advice of their Medical Officer of Health and chief inspector.

No. 6.

Report on an Epidemic of Enteric Fever in the Borough of Worthing and in the Villages of Broadwater and West Tarring; by Dr. Theodore Thomson.

On May 23rd, 1893, the Board was informed by the Medical Officer of Health of the borough of Worthing that an outbreak of enteric fever was in progress there, and that measures were being taken by the Sanitary Authority to deal with the disease. This information was followed by a more detailed report from the Medical Officer of Health, received by the Board on June 2nd. In this report the epidemic was stated to be abating, and some particulars were given as to the measures that had been adopted by the Sanitary Authority, and as to the probable cause of the outbreak. In a further report, dated June 17th, the Medical Officer of Health gave statistical account of the fever, and stated that the epidemic was over. Early in July, however, the Board received from the Sanitary Authority, and from medical men and others resident in the place, representations setting forth that a further and more formidable outbreak of enteric fever was in progress, and urging the Board to make inquiry into the cause of this outbreak. I was accordingly instructed by the Board to make inquiry into the circumstances in which enteric fever had been prevailing in Worthing, and to this end I visited Worthing, on July 12th and on several subsequent occasions. The facts which, as the result of my investigations, came to my knowledge I now proceed to set forth.

During 1893 only two cases of enteric fever had, prior to the month of May, been notified to the Worthing Urban Sanitary Authority as having occurred in their district. One of these cases occurred in January the other in February. On May 3rd an additional case of enteric fever was notified to the Urban Sanitary Authority, to be followed five days later by the notification of a plurality of cases. Thenceforward the disease increased so rapidly that by June 9th notification of 284 cases had been received. From June 10th to July 1st there would appear to have been a lull in the extension of the disease, for the notifications received during these three weeks amounted to the relatively small number of 19 only. But, on July 2nd, the number of persons attacked began again to increase and this so markedly that in the course of July alone no less than 678 fever cases were notified to the Urban Sanitary Authority as occurring in their district. Subsequent to July the epidemic continued to prevail, although with gradual abatement, through August, September, and October, but had, by the end of November, so far diminished that during that month no more than nine cases of the disease were notified to the Urban Sanitary Authority. In all, during the period from May 3rd to the end of November, 1,315 attacks are known to have occurred in the borough of Worthing, with 168 deaths.

In addition to the town of Worthing, two neighbouring villages, Broadwater and West Tarring, participated in this epidemic. During the already-mentioned period of May 3rd to the end of November, 55 cases of enteric fever are known to have occurred in West Tarring and 41 in Broadwater, nine proving fatal in each of these places. The total number, therefore, of persons known to have been attacked by enteric fever during this period in Worthing, Broadwater, and West Tarring amounts to 1,411.

These three places, Worthing Borough, Broadwater, and West Tarring, lie near together at the foot of the Sussex Downs. Worthing abuts on the sea, while the villages of Broadwater and West Tarring lie inland in a northerly direction from Worthing. Broadwater village lies rather less than a mile to the east of the village of West Tarring and both are practically continuous with Worthing. All three are on the

Chalk, which for the most part lies very near the surface. Across part of Broadwater runs a narrow alluvial strip; and this is the case in Worthing also, where, moreover, the Reading and Woolwich Beds are sparingly represented.

The borough of Worthing is 1,405 acres in extent, and at the census of 1891 contained 3,044 inhabited houses, with a population of 16,606 persons. The villages of Broadwater and West Tarring are both in the East Preston Rural Sanitary District, and contain the greater part of the population of the parishes of the same names. In view of the limitation of the epidemic to the village portions of these parishes I had a census made of these villages during the summer of 1893; and in this way ascertained that Broadwater village then contained 191 inhabited houses with a population of 787, and West Tarring 229 inhabited houses and 1,070 persons. The following tables (Tables I. and II.) show, from May to November inclusive, the incidence of enteric fever, as regards both sickness and mortality, on each of the areas invaded.

In these Tables, and throughout the rest of this report, the borough of Worthing is for reasons which will presently appear, regarded as consisting of two parts, termed respectively "Worthing" and "West Worthing." Reference to the Urban Sanitary District of Worthing, which comprises "Worthing" and "West Worthing," will herein-after be made only under the title "Borough of Worthing."

TABLE I.

SHOWING severally for "WORTHING," "WEST WORTHING," WEST TARRING, and BROADWATER, the POPULATION, the NUMBER of ENTERIC FEVER CASES ascertained to have occurred in the Seven Months May to November 1893, and the Rates of Attacks per 1,000 of the Population.

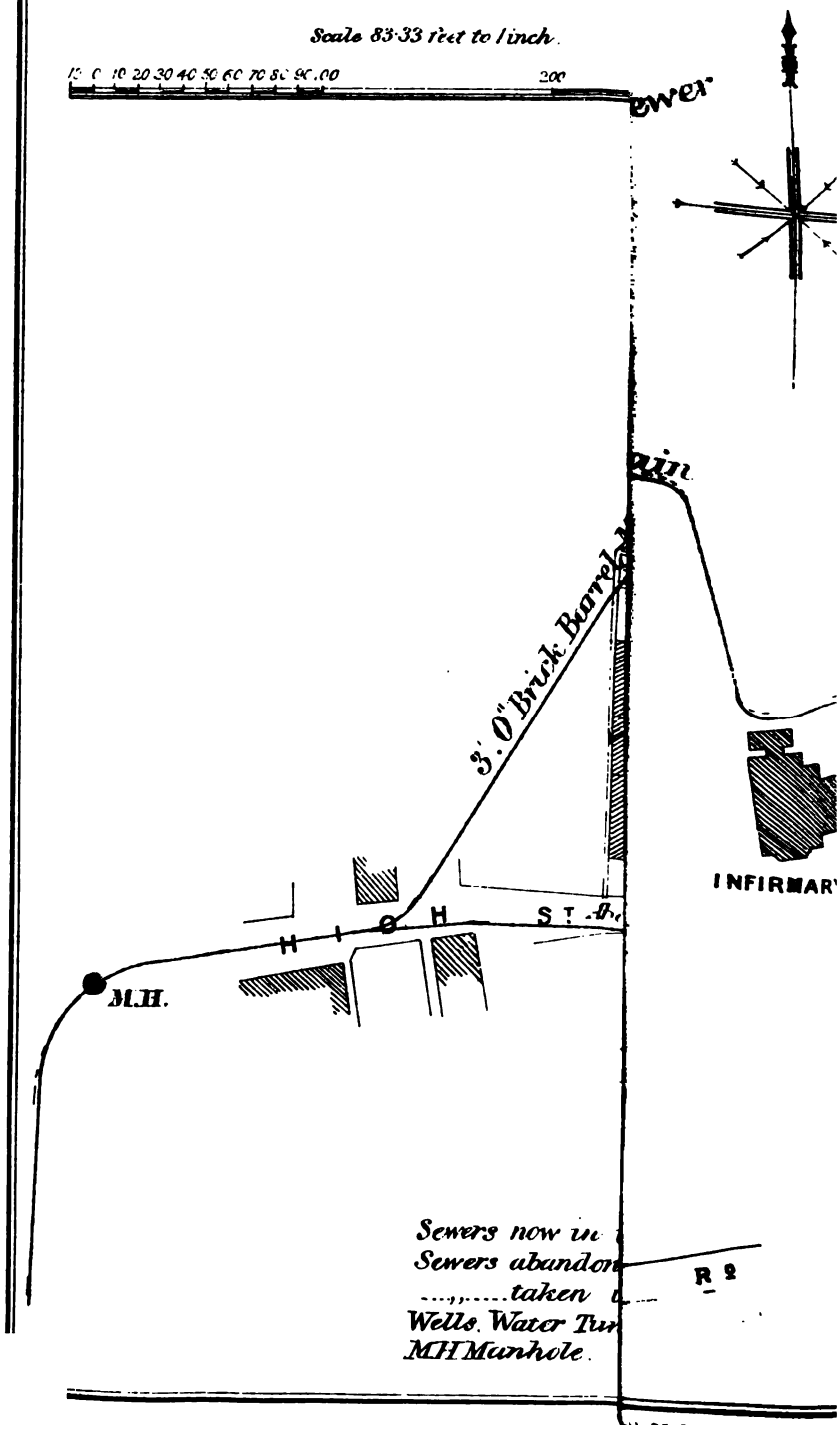
Sanitary District.	Area invaded by Enteric Fever.	Estimated Population in middle of 1893.	No. of Cases of Enteric Fever.	Attack-rate per 1,000 Population.
Borough of Worthing	"Worthing" -	15,317	1,257	82·0
	"West Worthing" -	2,116	58	27·4
East Preston Rural Sanitary District -	Village of West Tarring - -	1,070	55	51·4
	Village of Broadwater	787	41	53·4

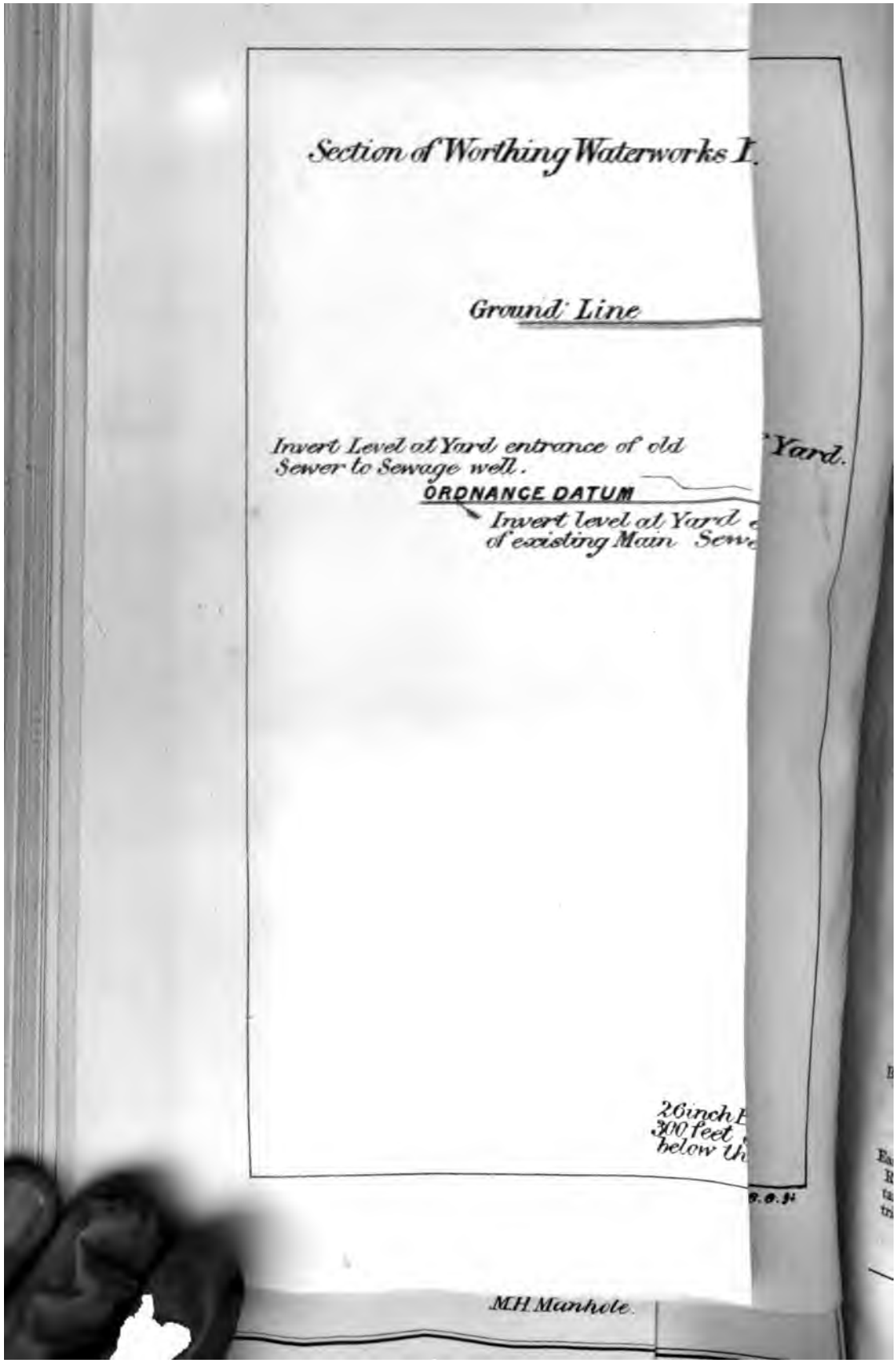
TABLE II.

SHOWING severally for "WORTHING," "WEST WORTHING," WEST TARRING, and BROADWATER, the POPULATION, the NUMBER of DEATHS referred to ENTERIC FEVER in the Seven Months May to November 1893, and the Resulting Death-rates per 1,000 Inhabitants.

Sanitary District.	Area invaded by Enteric Fever.	Estimated Population in the middle of 1893.	Enteric Fever. No. of Deaths.	Enteric Fever. Death-rate per 1,000 Inhabitants.
Borough of Worthing	"Worthing" -	15,317	153	10·0
	"West Worthing" -	2,116	15	7·1
East Preston Rural Sanitary District -	Village of West Tarring - -	1,070	9	8·4
	Village of Broadwater	787	9	11·4

DIAGRAM I. BLOCK PLAN




Section of Worthing Waterworks L
Ground Line
Invert Level at Yard entrance of old Sewer to Sewage well.
Yard.
ORDNANCE DATUM
Invert level at Yard
of existing Main Sew
26inch
300 feet
below
M.H Manhole

App. A. No. 6.

On Enteric Fever in Worthing, Broadwater, and West Tarring; by Dr. Theodore Thomson.

Enteric Fever in and about Worthing in previous Years.

The history of the above areas as regards enteric fever mortality during the past 11 years will be gathered from the annexed table (Table IV.), where I have dealt with "Worthing" and "West Worthing" together, under the title "Borough of Worthing." I make no attempt to supply death rates per 1,000 living for any local area except the borough; the small size of the villages of West Tarring and Broadwater rendering, as I have said, calculations based on the few figures for these areas of very doubtful value.

Table IV.

Showing year by year for the 11 years 1883–1893, the Deaths from Enteric Fever in the Borough of Worthing, and in West Tarring and Broadwater Villages; and affording comparison of Death-rates from this disease in the Borough and in England and Wales.

Year.	Borough of Worthing (comprising "Worthing" and "West Worthing").			No of Deaths from Enteric Fever in the		England and Wales.
	Population.	No. of Deaths from Enteric Fever.	Enteric Fever. Death-rate per 1,000 living.	Village of Broadwater.	Village of West Tarring.	Enteric Fever Death-rate *per 1,000* living.
1883	12,180	2	0·16	—	—	0·23
1884	12,650	2	0·16	—	—	0·24
1885	13,040	3	0·23	—	—	0·17
1886	13,200	1	0·08	—	—	0·18
1887	13,350	1	0·08	—	—	0·18
1888	13,800	—	0.00	—	—	0·17
1889	14,200	2	0·14	—	—	0·18
1890	14,650	2	0·14	—	—	0·18
1891	16,722*	—	0·00	—	1	0·17
1892	17,220	3	0·17	—	2	0·15†
1893 (May to Nov.)	17,433	168	9·64	9	9	0·16‡

It will be seen, on comparison of the figures in Table IV. for *the* Borough of Worthing with those for England and Wales that, *antecedent* to 1893, this borough suffered less from enteric fever mortality than the country at large. Rarely did its death-rate from enteric fever equal the corresponding rate for England and Wales. So, too, with the villages of Tarring and Broadwater; in them no death was attributed to enteric fever during the first eight of the 11 years tabulated. In 1891 one death and in 1892 two deaths were referred to this cause in West Tarring village; but during these two years, as in the preceding eight, Broadwater remained entirely free from fatal enteric fever.

* In September 1890, the limits of the borough were extended, and the additional population thus included accounts in part for the considerably increased population of 1891.

† The 1892 figures in this column are those given in the Registrar-General's quarterly returns as to "Fever;" they represent the death-rate from enteric, typhus, and simple or ill-defined forms of continued fever.

‡ "Fever" death-rate per 1,000 living in England and Wales during the second, third, and fourth quarters of 1893.

shorter period than that covered by the table. Table VI. and the charts corresponding to it (Charts III. and IV.) are based upon the *actual dates* on which persons attacked are stated to have first shown symptoms of illness, and are therefore to be preferred in comparisons as to time-incidence of the disease on one and another area.

TABLE VI.

SHOWING the Number of ENTERIC FEVER Attacks *ascertained to have commenced* in each fortnight from March to December 1893, in "WORTHING," "WEST WORTHING," WEST TARRING, and BROADWATER.

Period.	"Worthing" (population, 15,317).	"West Worthing" (population, 2,116).	Village of West Tarring (population, 1,070).	Village of Broadwater (population, 787).
The month of January	1	—	—	—
„ February	1	—	—	—
„ March	—	—	—	—
April 1—14	—	—	—	—
„ 15—28	9	—	—	1
„ 29—May 12	153	—	1	2
May 13—26	106	—	—	—
„ 27—June 9	24	—	—	2
June 10—23	59	—	—	—
„ 24—July 7	391	4	6	12
July 8—21	225	2	3	12
„ 22—Aug. 4	110	24	21	4
Aug. 5—18	78	11	14	4
„ 19—Sept. 1	30	4	2	—
Sept. 2—15	41	9	1	—
„ 16—29	10	—	2	—
„ 30—Oct. 13	6	1	5	1
Oct. 14—27	9	—	—	2
„ 28—Nov. 10	5	2	—	1
Nov. 11—24	1	1	—	—
„ 25—Dec. 8	—	—	—	—
Total	1,259	58	55	41

Study of these data reveals the fact that the behaviour of the disease, in the matter of time distribution, was not the same in all four invaded areas.

Incidence in regard of Time.—In "Worthing" the first case of the epidemic would appear (*see* Chart III.) to have occurred in the second fortnight of April; and in this area, after a sharp outburst occupying mainly the first three weeks of May, the epidemic abated considerably. This decadence of the fever did not, however, long continue. About the middle of June, there occurred fresh increase in the number of attacks, which culminated about the end of the month and the early part of July in an outburst of remarkable intensity. During the remainder of July and through August and September the fever in "Worthing" was maintained with occasional exacerbations but with gradual abatement. By October it had so far diminished that in that month but 18 persons are known to have been attacked. By December the epidemic may be considered to have been over, as three attacks only are known to have occurred in the previous month.

In the village of Broadwater one case of enteric fever is known to have commenced in the latter part of April, while two are recorded in

the month of May, and two more in the beginning of June. Having regard to the comparatively few inhabitants of the village, the incidence of the enteric fever thus corresponds in time with the behaviour of the disease in "Worthing," although Broadwater suffered less than "Worthing" relatively to its population. But in Broadwater as in "Worthing," there was a marked recrudescence of the disease at the end of June and in the beginning of July; at this time, indeed, Broadwater suffered rather more than "Worthing" in proportion to its population. After the middle of August the disease would seem to have been in abeyance in Broadwater until October, when three cases are known to have occurred, and one more person was attacked in November. It will, therefore, be seen that, making allowance for the element of uncertainty always attaching to figures dealing with small populations, the rise and subsequent course of the disease in Broadwater was parallel with that in "Worthing."

But in "West Worthing" and in West Tarring the commencement and the progress of the enteric fever outbreak that occurred in these places were in some respects totally unlike what took place in "Worthing" and Broadwater.

In West Tarring, with the single exception of one case in the early part of May, no person is known to have been attacked by enteric fever until June 30th; moreover, the chief outbreak of the fever in this place did not occur until the end of July or the beginning of August; that is to say, not until a month later than the time at which the incidence was greatest on "Worthing" and Broadwater. After the month of August occasional cases are known to have occurred in West Tarring up to November 14th, since when the disease does not appear to have manifested itself in the village.

In "West Worthing" no person is known to have been attacked by enteric fever prior to June 26th. In this district, as in West Tarring, the chief prevalence of the fever did not, as in "Worthing" and Broadwater, occur in May and again in early and middle July, but at the end of July and in the beginning of August. Here too, again, as in the case of West Tarring, the disease would seem to have made only occasional appearances after the month of August.

From the foregoing account it appears that, as regards the date at which the disease became epidemic, and, as regards also that at which it reached its maximum, "Worthing" resembled Broadwater, whereas "West Worthing" resembled West Tarring; and, further, that "West Worthing" and West Tarring differed conspicuously from "Worthing" and Broadwater in this sense.

Distribution over Area.—Differences appear also as regards the extent to which the total area of each of the four invaded localities was implicated by the fever epidemic. These differences are illustrated by the maps, to which I have already made reference, and which are attached to this report. The maps in question cover the period April 15th to October 13th, and on them the cases of enteric fever, as they occurred fortnight by fortnight, are represented by red dots. The fortnightly periods thus illustrated correspond with the fortnightly periods in Tables V. and VI. From these maps it will be seen that the fever was generally and well nigh impartially distributed throughout "Worthing." Certain parts of this area, it is true, show now and then a thicker clustering of spots than is elsewhere noticeable; but these are the localities in "Worthing" which are most densely inhabited, and where, accordingly, with an equally diffused cause of fever, a closer aggregation of cases would be anticipated. In Broadwater, also, the

distribution of the disease is observed to be general over the whole village. In "West Worthing," on the other hand, this indifference of distribution of the fever is not found. There was a large preponderance of cases (47 out of a total 58) in a block of streets occupying the south-east corner of "West Worthing." It is true that this is the part of "West Worthing" which is most densely inhabited, containing as it does 970 out of the total 2,116 persons in the place; but with due allowance made for this fact, the proportion of cases occurring hereabouts shows a very special incidence on this section of "West Worthing." A similar special localisation of the fever is to be seen in the distribution of cases in the village of West Tarring, where a group of streets near the southern limit of the place were affected in much greater degree than the remainder of the village. The group of streets referred to contains less than two-thirds of the population of West Tarring village; and yet 51, out of the total number of 55 known cases of enteric fever, occurred in this particular locality.

Thus, as regards distribution over area as with distribution in time, the behaviour of the epidemic in "Worthing" resembled the behaviour of the epidemic in Broadwater; while the "West Worthing" outbreak resembled, in both senses, that in West Tarring. There can be no question that the latter two places were invaded in different fashion from the two former. The disease was co-incident in time in, and general in its distribution throughout, both "Worthing" and Broadwater, whereas in "West Worthing" and in West Tarring the epidemic was later in appearing, and the fever when it came was to a great *extent* limited to a particular section of each of these areas. These discrepancies might, it was seen, be thought to suggest that the prevalence of enteric fever in the four invaded places had been due to diverse fever agencies; and, accordingly, in searching for the factor or factors responsible for the occurrence of the disease due regard was had to this aspect of the question.

Cause of the Outbreak.

In searching for the factors concerned in the epidemic prevalence of enteric fever in these four localities, the general sanitary circumstances, the sewerage and drainage, the milk and the water supplies were in turn investigated. Each of these possible agencies of fever distribution I shall now pass in review.

General Sanitary Circumstances.

In "*Worthing*" *with* "*West Worthing*"* the streets are for the most part well constructed and are kept clean; the houses of the poorer classes are in fair condition; but in not a few instances open space around poor class dwellings is somewhat scanty. Excreta are removed by water carriage; the prevailing form of closet basin being the long hopper, not always, however, provided with a separate flushing cistern. Disposal and removal of house refuse leave a good deal to be desired. The lower parts of the town are liable to occasional flooding from backing up of sewer contents by the tide. A considerable nuisance is not infrequently caused by the odour arising from decaying accumulations of seaweed on the foreshore. These accumulations are sometimes very large, especially after a south-westerly gale.

* It will be remembered than these places are under the jurisdiction of one and the same sanitary authority, the Town Council of Worthing.

Prior to April 1893, when the amount of the "Worthing" water supply was increased, the sewers were flushed by occasional release of considerable volume of their contents, previously penned up at certain points by means of movable discs until a sufficient head of sewage had been gained. The surveyor states that after the increase of water supply in April 1893, "the sewers were well flushed by hose pipes at "the manholes prior to the epidemic, and extra flushing was done "during the epidemic both to sewers and house drains, the extra water "pumped for this purpose daily often being at the rate of 25 gallons "per head over the normal supply of 30 gallons per head." Owing to the low level of "Worthing"—of which the highest point on the ground surface is but 36 feet above Ordnance datum, while in places it is only 9 feet above datum—the sewers are tide-locked during large part of the 24 hours. The "Worthing" outfall sewer is a 4-foot barrel which discharges, about one and a half mile east of Worthing pier, into a 30-inch iron pipe by which the sewage is carried out to sea. Some experiments conducted by the Borough Surveyor showed that "in dry "weather the backing up of the sewers at entrance to waterworks yard "during tidelock ranged from 2 ft. to 3ft. 1 in. above invert, with a water "supply of 30 gallons per head; in wet weather the backing-up "extended to the bottom of South Street, and, during storms, along "Montague Street and up branch sewers." The amount of backing up thus set forth will be better appreciated when I state that the invert of the sewer at the entrance to the waterworks yard (shown as an irregular blue patch near to Park Road, Worthing, in Map 1) is at Ordnance datum level.

House drains are in few instances properly ventilated and disconnected from the sewers. Disconnexion of house drains from interiors of houses is usual as regards sink and bath wastes; but soil pipes are not infrequently ventilated by shafts of too small diameter, and are in some instances devoid of ventilation. The majority of waterclosets, however, are situated out of doors.

"*West Worthing.*"—The description just given of the "Worthing" sewerage and drainage arrangements applies equally to the "West Worthing" sewerage and drainage, although the "West Worthing" sewers constitute an absolutely separate system. They are at no point connected with the sewers of Worthing or of any other district, and they discharge by a separate outfall into the sea, about a mile to the west of Worthing pier. In "West Worthing" also the sewers back-up during tide-lock; main sewers have not always a proper fall, and old sewers are in the condition already described. As regards house drainage, the unsatisfactory features referred to as existing in connexion with "Worthing" are equally common in "West Worthing."

West Tarring.—The main sewerage arrangements in West Tarring village resemble the more recently and better constructed sewers of "Worthing," of the sewerage system of which the West Tarring sewers constitute a part. The whole of the West Tarring sewage, save that from 14 houses—which either drain into cesspools or have no drainage arrangements—passes into the village sewers, thence into the "Worthing" sewer, and so into the sea through the Worthing discharge pipe. House drainage in West Tarring resembles that of "Worthing" and "West Worthing."

Broadwater.—In Broadwater there is no system of sewerage. For the most part houses drain into cesspools, which are cleansed at irregular intervals. Disconnexion of sink wastes is usual, and indoor waterclosets are rare. House drains are unventilated.

So far, then, as sewerage arrangements are concerned, it is clear that the main outbreak, which followed a parallel course in "Worthing" and Broadwater, cannot be attributed to sewer emanations, inasmuch as Broadwater has no drainage relations with "Worthing," and is indeed devoid of sewers. Nor was there, assuming sewer emanations as a cause of fever in "Worthing" itself, exceptional incidence of the disease on the inhabitants of houses in those streets known to be badly sewered. The two localised, though separate, outbreaks in "West Worthing" and in West Tarring, respectively, present perhaps behaviour more compatible with sewer infection; but even in these instances there must be hesitancy in attributing the disease to this cause. For the "West Worthing" and the West Tarring sewers are on separate systems, and the sewers of the invaded localities in those areas were in better condition than those in other streets that escaped or were but lightly touched by the epidemic; and, in addition, almost all the invaded houses in these two places were properly secured against entrance of sewer air into their interiors.

In short, the behaviour of the disease generally is opposed to any probability of sewer infection as a cause. Its behaviour in "Worthing" was similar to its behaviour in Broadwater village, and yet the "Worthing" sewers do not extend into Broadwater village, which is, as has been said, wholly without sewers. In "Worthing" and West Tarring, again, there were striking differences in the manner of rise and progress of the fever, notwithstanding that these two places have a common sewerage system. In "West Worthing," moreover, which has its own separate sewerage system, the disease behaved quite otherwise than in "Worthing," and instead closely followed the course taken by it in West Tarring, which is, as already stated, on the same sewerage system as "Worthing."

In view of these facts, it becomes apparent that a sufficient explanation of the cause of the outbreak of enteric fever in these four places is not to be found in infection propagated by emanations from sewers.

Milk Supply.

In the rapidity with which they obtained their maxima in the four places invaded, the enteric fever outbreaks displayed a feature usually to be found in epidemics of which the causation lies in milk. On the other hand, the persistence of these outbreaks, and their slow subsidence, did not harmonize with this method of causation of the fever, nor was there that especial incidence of the disease on women and children* so characteristic of milk epidemics. It did not seem probable, moreover, seeing that all four places receive their milk in large part from the same vendors, that two of these places should have been attacked in April and May, and again in June and July, while the other two should have almost entirely escaped until July–August. Nevertheless, careful inquiry was made into the possible operation of milk supply in causing any of the outbreaks in the four localities. In "Worthing" the source of milk supply was ascertained in the case of 1,231 out of the 1,257 persons attacked. The milk supply of these 1,231 persons came from one or other of all the milk vendors in "Worthing," who are 15 in number. Similarly the milk supplied to those persons who had contracted enteric fever in Broadwater, came from six different vendors; in "West Worthing" from eight; and in West Tarring from four

* The incidence of the fever on sex and age was closely studied in view of this and of other considerations.

sources. Attempt was also made to ascertain what proportion of the total customers of each separate vendor had been attacked; but the difficulties experienced in trying to obtain the number of customers in each instance were found to be so great as to forbid more than an approximate estimate on the subject. Sufficient was learned, however, to show that the proportion of cases to customers was in no instance so exceptional as to point to milk having acted as the medium of propagation of enteric fever in any of the outbreaks in the four places invaded.

Water Supply.

In the absence of evidence implicating, as cause of the epidemic, any one of the possible agencies thus far discussed, water supply—which has so often been found elsewhere to have served as the medium of sudden and widespread propagation of enteric fever—naturally came under suspicion.

The four areas affected by the fever are supplied, as stated at an earlier stage of this report, with water from three sources, viz., the "Worthing" public service, the "West Worthing" public service, and local wells. A proper comprehension of the part that water may have played in bringing about the epidemic cannot be arrived at without a detailed account of the circumstances of these water supplies, and the different conditions of distribution of public water service in one and another of the several areas.

The "Worthing" Public Service.—The "Worthing" Waterworks are the property of the Worthing Corporation, and are situated within the borough. They are depicted as an irregular blue area on the annexed map (Map 1) showing the distribution of the water mains. The site is an enclosed plot of ground of about two acres in extent. The Chalk here lies at a depth of about 18 to 20 feet from the surface, the intervening soil consisting from above downwards of loamy mould, marl, and chalky marl. The supply is from certain deep wells and from headings therefrom driven into the Chalk, the water being pumped up by an engine on the site. This water is not filtered. The greater part of this supply is delivered directly into a rising main, by which it is distributed to "Worthing" and to Broadwater, but not to "West Worthing" or to West Tarring; the surplus passes into a tank situated at the top of a brick tower 90 feet in height. When this tank is full the engine ceases pumping, and the tank water is distributed by gravitation until the tank is about three parts emptied; whereupon, this supply is stopped, and the engines again pump from the wells directly into the mains and tank. The supply, therefore, is constant. Tank-water is usually distributed by the "Worthing" mains from 6 a.m. to 6.30 a.m., and again from 12 noon to 12.30 p.m. The pressure in the mains while the tank supply is being delivered is about 30 lbs. per square inch. The pressure when water is being pumped directly into the mains is 25 lbs. during the day and 12 lbs. during the night. If, however, the drains and water mains are to be flushed during the night, the full pressure of 25 lbs. is kept up.

This water is obtained from three wells with three headings, two of the headings serving as connecting tunnels between the three wells. Comprehension of the relationships of these one to another, and of the historical description about to be given, will be facilitated by reference to the accompanying diagrams (Diagrams I. and II.).

The "Worthing public service dates from 1857, when the well-shaft marked A in the diagram was sunk. This well lined with iron

cylinders, has an internal diameter of 5 feet, and is 68 feet in depth; and from the bottom of the well a 12-inch bore-hole proceeds for another 300 feet. It yields 4,500 gallons per hour, and constituted the sole public supply until 1867, when a second well-shaft, that marked B on the diagram, was sunk. This well (B), also lined with iron cylinders, has an internal diameter of 6 feet, and is 104 feet in depth; and from the bottom a 26-inch bore-hole proceeds for another 300 feet. It yields 9,000 gallons per hour. At the time when well B was sunk, it was connected with well A by a siphon; for which a tunnel was substituted in 1880. This tunnel is at a depth of 72·6 feet from the surface, and is 113·4 feet in length. It has an internal diameter of 6 feet by 4 feet, and is lined with brick in cement, a brick being omitted every 18 inches in the bottom row of each side to permit ingress of water. This tunnel yields some 2,000 gallons per hour. In 1885 the Corporation again sought to augment their supply, and with this view, commenced sinking another shaft in the north-east corner of the waterworks enclosure. But at a depth of only 18·6 feet from the surface (just before reaching the Chalk and in circumstances unfavourable therefore to the quality of the discovered water), so large a quantity of water * was encountered that the proposed sinking at this spot was abandoned, and another shaft was sunk, also in 1885, at a spot about 60 feet to the south-west of the abandoned shaft. The new well in this way provided is that marked C on the diagram. In sinking this well (C) a small amount of water was encountered about 20 feet from the surface, after which a gradual increase was noted until the excavations terminated. This well lined with brickwork in cement, is 72 feet deep, and has an internal diameter of 7 feet. It was not provided with a bore-hole, but a tunnel was constructed leading from well C to the tunnel connecting wells A and B. This tunnel is 72 feet from the surface, has a length of 234 feet, and internal dimensions of 6 feet by 4 feet, and is constructed similarly to the tunnel leading from well A to well B. The yield from this source and from well C (which supplies the major part) is 7,000 gallons per hour.

The quantity of water derived from these various sources, however, was again found to be insufficient for the increasing population of the district, and, accordingly, in the beginning of the year 1893 further supplies were sought for. With this view it was resolved to drive a heading in a north-easterly direction from the bottom of well C, and on March 13th this work was commenced. As the work proceeded several small fissures were encountered, and on April 13th, when the heading was 68 feet in length, the total yield was estimated at about 60 gallons per minute. On April 14th, at 2 p.m., a large fissure estimated as yielding 2,623 gallons per minute was cut into. The heading, of which the internal dimensions are 6 feet by 4 feet, and of which the structure is similar to that of the other tunnels, was at this time 70 feet in length. So sudden and so great was the inrush of water from the fissure now struck, that the men employed in the work of excavation had to forsake their tools and run for their lives. The additional water thus obtained was forthwith utilised for service to "Worthing" and Broadwater, and from this date forward the supply was derived from all the sources I have described.

The "West Worthing" Waterworks are the property of a Company and are situated in "West Worthing" on an enclosed piece of ground, which is rather more than two acres in extent. The position of this site is marked on Map 1. The soil here resembles that described under

* On making further excavations this water was seen to well up from a fissure at the surface of the Chalk at that point.

the heading *The "Worthing" Public Service.* The Company's water is obtained from two wells in the Chalk. One of these, stated to have been sunk in 1865, is an iron cylinder well, 32 feet in depth, and having an internal diameter of 12 feet. From the bottom of the well a bore-hole, 8 inches in diameter, proceeds to a further depth of 38 feet. The other well, said to have been sunk in 1887, is an iron tube well 130 feet in depth, and without bore-hole. Water is pumped from these wells at the rate of 20,000 gallons per hour, and pumping is usually carried on in winter from 6 a.m. to 11 a.m., and again from 2 p.m. to 5.30 p.m. In summer, pumping is from 6 a.m. to 5.30 p.m. with an intermission of one hour, viz., 1 p.m. to 2 p.m. There are no means of storage or filtration, and the supply, which is limited to "West Worthing" and West Tarring, is an intermittent one.

The remaining sources of supply in the four places, namely, supplies from *local wells*, need little description. Most of the wells are shallow and they are commonly dry steined; some few, however, are deep and well constructed.

Reference to Map 1 will show the distribution of the two public services throughout the four areas. The "Worthing" mains, which are limited to "Worthing" and Broadwater, are coloured blue; the "West Worthing" mains, which supply water only to "West Worthing" and West Tarring, are coloured red. I have already stated approximately what proportion of these places are served by local wells; I now append in tabular form these facts in detail.

Table VII.

Showing for each of the Four Areas invaded by Enteric Fever the Number of Houses obtaining water from one and another different Source of Supply.

Sanitary District.	Area invaded by Enteric Fever.	No. of Inhabited Houses.	No. of Houses on Public Service.	No. of Houses served by Local Wells.
Borough of Worthing -	"Worthing"	2,890	2,859 ("Worthing" Service)	31
	"West Worthing"	347	326 ("West Worthing" Service)	21
East Preston Rural Sanitary District -	West Tarring Village	229	169 ("West Worthing" Service)	60
	Broadwater Village	191	65 ("Worthing" Service)	126

It is now, in the light of these fact, desirable to reconsider the data respecting the time incidence of the fever given in Tables V. and VI. and in the corresponding charts. Reference to Charts III. and IV. will show that the first fever case of the epidemic in "Worthing," attacked on April 16th, was followed in a few days by many more cases; and that in Broadwater the first case, occurring on April 27th, was followed by two further cases in May: whereas in "West Worthing" no case whatever of enteric fever occurred in either April or May, and

ʒREST TARRING; BROADWATER.

of Borough of Worthing.

Line between Worthing and West Worthing.

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Water Mains of Worthing Public Service.

....., ..., ..., ...*West Worthing Public Service.*

thing Water Works Enclosure.

Worthing Water Works Enclosure.

home ill from "West Worthing" where she was in service occurred in houses in which there had been previous cases; and child) was subsequently declared by her medical attendant to be ing not from enteric but from scarlet fever. The remaining (of the 14) are unaccounted for. In this way it appears that 41 Broadwater cases no less than 34 had been in the habit of con "Worthing" water; one was not enteric fever, and as regards is there the statement that they had not before their illnes "Worthing" water.

It is evident, therefore, that there was comparative immuni enteric fever of persons, whether in "Worthing" or in Broa who habitually consumed water from local wells; and that the heavy incidence of the disease on those who used the water deliv the public service in these places.

But if the "Worthing" public service has been in fault, e should be forthcoming as to some alteration in its constitution pa the observed outbreak and maintenance of enteric fever among consuming it. In this aspect, the modification of this water involved in the addition to it of water from a new source in Apr at once presents itself for examination. Accordingly it is nece consider in detail the relations between the provision of the new of supply and the outbreak of enteric fever.

The first case of the epidemic in "Worthing" and Broadwa notified on May 3rd, and was quickly followed by several Inquiry as to the actual dates on which all these persons first established the fact that the first attack occurred on April 16 second on April 19th, and the third on April 21st. These, a or two other cases occurring towards the end of the month, followed, from April 28th onwards, by what may be called the body of the first outbreak. But as will be remembered, the large from which by far the greater part of the new supply was drav not cut into until April 11th; only two days, therefore, before t of these attacks. This fact, notwithstanding that the incubation of enteric fever may be shortened when water is the medium o mission, is of a sort to raise doubt as to connexion between the ad of water from the fissure in question and the outbreak of the feve a fuller account has, therefore, now to be given of the proceedin took place in driving the heading from which the new supply was, spring of 1893, obtained.

In my previous and more curtailed account I noted that th large yield from the fissure struck on April 14th was at once u But I did not state what became of the water, relatively small in a which had been encountered in the new heading prior to Apri and this I now do. Before excavation of the new heading wa menced, a sluice valve had been fixed in the tunnel leading from to the tunnel between wells A and B. This sluice valve, whi fixed in the tunnel near its departure from well C, was intended t vent water from well C, inclusive of water from the new he gaining access to the public service during progress of the new w since these were necessarily of a nature to cause some turbidity water in well C. The fixing of this sluice-valve was comple March 11th, and on March 13th excavation of the new headin begun. The heading was driven during the day-time and lined bricks in cement each night. Meanwhile the water derived fro new heading in course of excavation, with that from well C, was pumped up and either discharged on the surface of the water enclosure, or utilised for street-watering and sewer-flushing. B

App. A. No. 6.

On Enteric Fever in Worthing, Broadwater, and West Tarring; by Dr. Theodore Thomson.

later than the "Worthing" and Broadwater outbreak, but them concurrent in point of time—which are not to be explained hypothesis that the "Worthing" water had been acting as distributing agent of the enteric fever. The consideration of causation of these two outbreaks will be resumed later.]

As to the fever in "Worthing" and in Broadwater, which has provisionally referred to the "Worthing" water supply, the qu arises whether any circumstances have transpired pointing to possibility of this service, especially the section of it which has app to be implicated in the fever, having been exposed to dang pollution.

The "Worthing" waterworks are on all sides surrounded by inh houses which drain into the "Worthing" sewers. Reference previously given diagrams (Diagrams I. and II.) will show the re of the waterworks to the more important sewers in the neighbour and also it will be seen from these diagrams that on the site itself exist certain sewage arrangements now disused. These are deserv particular consideration.*

The sewerage arrangements, now disused, in the water enclosure, date back to the time when "Worthing" sewage delivered in the enclosure by the main sewer (entering it from the Street, which lies to the west of the waterworks) into two brick These tanks, shown on the diagrams, were each 36 feet in dept their contents used to be pumped to a sewage farm, or into a neigh ing watercourse, known as the Teville Stream. The tanks, respectively "sewage well" and "chain pump well," were connec their bottom by a 15-in. pipe. From the "sewage well" two ou passed in a south-easterly direction out of the waterworks enc One of them was a 15-in. stoneware pipe, the other a 12-in. rising made of iron; and by both sewage was conveyed to the sewage These pipes were about 2 feet below the surface of the ground. the "chain pump well" three 15-in. storm overflow pipes passed s side in a north-easterly direction out of the enclosure: two of discharged into the Teville Stream, while the third discharged in Park Road sewer. These pipes were constructed of earthenwar were laid side by side at a depth of about 15 feet from the surfac 1880, sewage pumping at the waterworks having been brought end, the sewer from High Street was bricked across at two points within the waterworks enclosure, the other in the street outsid "Worthing" sewage from this time being made to pass along th main sewer shown by a red line running north-east on the west side enclosure. At the same time the sewage tanks within the water enclosure were filled up with earth. The carrier pipes, however, p from the "sewage well" to the (now disused) sewage farm, alt rendered useless, were nevertheless left undisturbed; and they rem so until September 1892, when those portions that lay withi waterworks enclosure were taken up. Meanwhile the three ov pipes from the "chain pump well" had been, in 1885, blocked the north-east corner of the enclosure. The method employed i dealing with them consisted in taking up about 10 feet of the p and building a wall of bricks in cement across each end thus ex and filling in the space between the ends with earth. Accordin April 1893, none of these structures had for 13 years been in u

* The diagrams show the water and sewerage arrangements on the site an neighbourhood as they were on April 14th, 1893, when the new water supp struck.

year, was found to be defective and permitting leakage into the Another such was the Park Road sewer itself. This sewer, constru of 12-in. stoneware pipes jointed with clay, permitted leakage at s points, some of its joints gaping widely. It lies parallel to the eas of the waterworks enclosure at a distance therefrom of 150 feet, a at its nearest point some 160 feet from the spot under which lie extremity of the new heading. In addition, to the west of the works enclosure lies a 3-ft. brick barrel main sewer, some 210 distant from well C, and some 250 feet from the extremity of the heading. This sewer was also found to be in a leaky condition nea waterworks enclosure. Since it lies at a considerably greater than either of those already referred to, it is full of backed-up s when tide-locked; that is to say, twice every 24 hours.

It is sufficiently obvious, therefore, that the soil overlying the in which were sunk the wells and headings furnishing the supplied to "Worthing" and Broadwater, was liable to sustained tion, by sewage. It does not, of course, necessarily follow, becau overlying soil was thus liable to pollution, that water taken from ings deep below in the chalk would likewise be liable to dan pollution. Such pollution would, however, be very likely to occ surface-water were to readily gain access through the Chalk to the below, and there is reason to know that free communication did matter of fact, exist between the soil above the Chalk and the heading in the waterworks enclosure. It will be remembered the description given, at an earlier stage, of the "Worthing" works, reference is made to the fact that in 1885 a shaft was being sunk near the north-east corner of the enclosure had to abandoned owing to the large amount of water of very dubi quality that was encountered within 18·6 feet of the surf The water in this experimental shaft was at the time observed to up from a fissure in the Chalk; and this fissure was situated directly over the spot to which the new heading had been driven the large inrush of water of April 14th, 1893, was encountered.

With the view, therefore, of ascertaining whether or not the in question communicated with the new heading, I caused the of 1885 to be re-opened to a depth of 22 ft.; and into this re- shaft I had thrown, on August 17th, a ton of salt in solution. A of the water contained in well C was taken just before the salt was thrown down the shaft, and afterwards samples of this water taken at intervals on the same and on the two following days. samples were subsequently chemically analysed for chlorine. addition of the salt solution occupied a period of an hour and a q viz., from 11.30 a.m. to 12.45 p.m., and by 1 p.m., as will be see reference to the figures set out in Addendum A., the chlorine water of well C had enormously increased, while it had returned usual proportions a few hours later.

This experiment suffices to indicate that the fissure at the bot the abandoned shaft freely communicates with the new heading, it is evident that, given contamination by sewage of the ground and in the neighbourhood of that fissure, dangerous material readily gain access to the public water supply. Had circums

* This was subsequently confirmed in another way. In the course of diving operations in the new heading at a later period, it was observed th bubbled up through the water standing in the bottom of the abandoned shaft that this phenomenon was repeated wherever the divers were at work extremity of the new heading.

of the new heading by workmen employed in its excavation, a fact which he possesses evidence, may have been the cause of the April a May outbreak. No evidence, indeed, is forthcoming that any of t workmen employed were at that time suffering from enteric fev though of course it is not to be denied that slight and "ambula attacks of the disease are not always recognised. However this m have been, the sudden multiplication of attacks in the beginning of J may, with some probability, be attributed to pollution of the w supply on a large scale by infective material, derived from the cas the April and May outbreak. The excreta of almost all these pers would, like those of the fatal case of February 20th, pass along leaky main sewer that lies to the west of the waterworks enclosure; a in addition, it has to be borne in mind that the defective Park R sewer, which was connected with one of the overflow pipes previo referred to, received the infirmary sewage. In the months of May June, a large number of persons suffering from enteric fever w admitted into and treated at the infirmary. Into this institution w admitted 27 cases during May, 14 during June, and 9 during July. cases of enteric fever were admitted after July 9th. The Park R sewer was reconstructed in June, but up to June 26th the old se remained in use. Accordingly up to this date, enteric excreta w passing along a defective sewer situated on the east side of the wat works enclosure, in addition to the enteric excreta passing along t west side in the main sewer already referred to.

There still remain for consideration the fever-prevalences in "West Worthing" and West Tarring, both of which developed, it will b remembered, long after the epidemic had become established i "Worthing" and Broadwater. Each of these other fever-prevalenc —in "West Worthing" and in West Tarring respectively—is divisibl as will be seen from Table VI. and Chart IV., into two series of ca consisting:—

(1.) Antecedent to mid-July, of a series of earlier cases, few number and irregularly distributed in both places, but tend chiefly to affect one particular locality in each.

(2.) During, and in weeks subsequent to, mid-July, of a considera outburst of fever almost entirely localised in "West Worthin and West Tarring, in that section of each of these areas wh had already especially suffered from the malady.

The first series, *i.e.*, antecedent to mid-July, has already been counted for; the persons attacked during that period, whether "West Worthing" or in West Tarring, having almost without excep become infected in "Worthing." It is the outbursts constituted the second series of cases in "West Worthing" and in West Tarr respectively, that require explanation, and for the following reasons:

(*a.*) They were found not to be directly referable to antecedent fe either in "Worthing" or in their own localities.

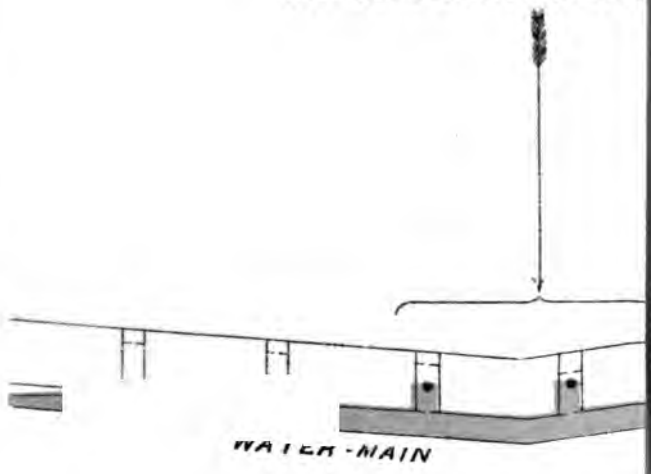
(*b.*) They were not attributable, as has already been shown, either defective general sanitary circumstances or to infect emanations from sewers or drains.

(*c.*) Milk supply, as has been shown in a previous section of t report, did not aid in the dissemination of this fever.

(*d.*) They could not be considered, if regard be had to the escape large sections of each locality, referable to water supply, unl limited areas of their common water service can have beco infected simultaneously by separate (or preferably by a sing fever agency.

There are, however, certain facts in connexion with the "W Worthing" water service, *which* is, as just stated, common *to the t*

DIAGRAM III.



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This hydrant consists of an iron pipe which communicates with the water main below, and in which is enclosed an ebonite ball. This ebonite ball is driven by the pressure of the water below up against a flange lined with india-rubber, and when thus situated prevents egress of water and ingress of foreign material. The whole is enclosed in an iron box with keyhole. The interior of the box not infrequently contains filth which has gained access by the keyhole of the hydrant box. When the pressure in the main falls below a certain amount, stated to be about 6 lbs. per square inch, the ball drops, and filth from the hydrant box or from the roadway may readily pass into the water mains. I ascertained by actual inspection at a time when the engines had for several hours ceased pumping, that the balls in the hydrants of the "West Worthing" service actually had dropped in the majority of instances, and that fouling of water in the mains below was thus rendered possible. Infective material, therefore, might in this way have gained access to the mains of the "West Worthing" water service, near the summit of the ridge above referred to, and might then, owing to the conditions that I have just described, have especially affected the two localities in which the disease was found chiefly to have prevailed. As a matter of fact, there was in 1892 a small outbreak in "West Worthing" and West Tarring which was localised in much the same way as the outbreaks now under discussion, and which Dr. Kelly, in his report on that outbreak, attributed to infection of water mains through ball hydrants.

With a view of ascertaining whether the water in the "West Worthing" water mains differed bacterioscopically from the same water at its source, samples of the supply were submitted to Dr. Klein from the rising main at the waterworks, and from a tap in Brunswick Road, a street situated in that section of "West Worthing" where there had been exceptional prevalence of fever. Unfortunately, however, this was not done until August 21st, when the acmes of the fever outbursts in "West Worthing" and West Tarring were past; and, whether for this or for other reason, the result of Dr. Klein's examination of the water was negative. Neither in the water from the rising main, nor in that from the main situated in the fever-invaded section of "West Worthing," was either the enteric fever bacillus or the bacillus coli discovered. (*See* Dr. Klein's report in Addendum C.) But while this bacteriological evidence fails to afford confirmation of the belief that specifically infected material had gained access to the "West Worthing" water supply, it cannot be held as proof that this water was free from infection at the time when fever was most prevalent (during the period mid-July to mid-August) in the invaded areas, nor, indeed, that it (or some of it) was not specifically polluted at the time when the samples were collected. For specific organisms are usually present in water in small amount only, and may readily be absent in small samples selected for examination out of the total bulk of water.

Upon a balance of considerations I incline to belief that the fever outbursts in "West Worthing" and West Tarring, during the period mid-July to mid-August, and in subsequent weeks, are referable to localised infection of water mains in the invaded sections of these places.

In what particular way the water in the "West Worthing" water mains may have become specifically infected there is not sufficient evidence to show. It has been suggested that the "West Worthing" and West Tarring outbreaks might be explained by the fact that during a few days in July and August 1893, the "West Worthing" streets were, for the first time for 2½ years, watered with "Worthing" water. This step was taken owing to an unusually heavy drain on the "West

"(*d.*) To flush the house drains and sewers.
"(*e.*) To disinfect excreta of infected patients.
"(*f.*) To provide hospital accommodation, and nurses to attend the sick.
"(*g.*) To submit samples of water to bacteriological analysis.

Consequent on these resolutions the following steps were taken, viz.:—

The reservoir on the top of the water tower was emptied, cleansed, and hot limewashed during the night of the 15th–16th May. This procedure was repeated on June 1st and on September 22nd. The work of placing hydrants at all dead ends of water mains not already provided with these was begun on May 15th. On the same date the water mains were flushed and the hydrants blown out. This flushing of water mains was frequently repeated every day for a fortnight, and at occasional intervals up to the end of November. Besides the publication of warning advertisements in the local papers, a card was sent to each house in the borough cautioning the inhabitants against the use of unboiled water or of unboiled milk. Printed notices and handbills containing similar instructions were freely distributed on several occasions. Samples of water were taken and sent to Professor Crookshank, King's College, London, for bacterioscopic examination, as follows:—

From well C, May 16th (this was broken in transit).
From tank, May 15th.
From well C, May 22nd.
From well C (two samples), June 5th.

At subsequent dates the following further steps were taken in connexion with water supply:—On June 17th a circular letter was sent to all owners of property and house agents in the borough, requesting that all drinking water cisterns should be cleansed and wiped dry. In the case of empty houses this was required to be done forthwith. Tanks for a special supply of water for drinking and cooking purposes were placed at convenient points in the streets on July 18th. At this date, and for some time afterwards, water was supplied to these from the "West Worthing" waterworks.

On July 29th, under direction of the Sanitary Authority, an attempt was made by a skilled diver to close the fissure in the new heading from well C at the Worthing waterworks, but without success. A second and more carefully considered attempt was made on August 23rd by two experienced divers, but this also failed. The object in view in making these attempts to close the fissure was the exclusion from the "Worthing" public service of the water contributed thereto from this fissure. In this way it was hoped that further pollution of the public water supply would be avoided.

Steps were also taken with the view of acquiring a new and pure water supply of a permanent character. To this end, and in consequence of an application made by the Worthing Corporation for loan of 3,000*l.* for preliminary expenses in connexion with works of water supply, a public inquiry was held at Worthing on August 1st by the Board's Engineer Inspector, Mr. Arnold Taylor. At the inquiry it appeared that the source of such new water supply had not yet been decided on, and up to the beginning of 1894 no definite scheme of works for a permanent water supply had been submitted by the Sanitary Authority to the Board.

Meanwhile a shaft was sunk in the Chalk near the village of Broadwater, from which, it was hoped, a temporary supply would be obtained sufficient in amount to enable the Worthing Corporation to entirely

and at once dispense with the existing polluted public service. From September 4th onwards the street tanks, before referred to as furnishing the inhabitants with a special supply of water for drinking and cooking purposes, were filled with water from this new well near Broadwater; and on September 22nd these Broadwater works had so far progressed that it became possible to pump the new supply into the mains of the "Worthing" public service. Since September 22nd, therefore, the polluted supply has been entirely replaced by the Broadwater supply. For a time, however, the street tanks still continued to be filled from the Broadwater new well, the water in the mains, which had not as yet been disinfected, being supplied chiefly for drain-flushing purposes; but, according to Dr. Kelly, the Medical Officer of Health for the borough of Worthing, many persons probably took their water direct from the mains for drinking and cooking purposes. The provision of this temporary supply of water from the Broadwater well was due to the energy of Mr. Alderman Cortis, a member of the Worthing Sanitary Authority, at whose cost, indeed, the necessary initial works were taken in hand. Later, with the view of disinfecting the water mains of the "Worthing" service these were, on the evening of October 21st, charged with lime-water, and were kept so charged during the two days following.

Isolation of Persons attacked by Enteric Fever.—In the absence in Worthing of hospital accommodation for infectious diseases, the following special arrangements were made for the isolation of cases of enteric fever:—On May 16th the Committee of the Worthing Infirmary set aside nine beds for the treatment of enteric fever, and on May 19th two hospital tents, each containing eight beds, were erected for the same purpose in the infirmary grounds. The following places were subsequently converted temporarily into hospitals for the reception of enteric fever, namely:—On July 7th, the Richmond Convalescent Home; on July 12th, the Newland Road Mission Room; on July 15th, the Lyndhurst Road Primitive Methodist Chapel; on July 17th, the "Travellers' Rest" lodging-house; on July 18th, the "Retreat," High Street; on July 26th, Mr. Ralli's private hospital on Marine Parade. In all 422 enteric fever cases from the borough of Worthing were admitted into one or other of the foregoing institutions. A staff of nurses was engaged for each of these places, and, in addition, the Nursing Association provided, at the expense of the Worthing Corporation, nurses to attend the sick at their own homes. Pony carriages were used to convey these nurses from house to house; and in this way persons treated at home were visited at least once and frequently twice each day.

Convalescents.—Accommodation for convalescents from all invaded areas was provided in homes temporarily taken at Goring, Findon, as well as at Chichester House and Milton House, Worthing. Expenses in connexion with these homes were met by the "Mayor's Sick and Poor Fund."

Disinfection.—Infected rooms found to be overcrowded or in a dirty state were fumigated with sulphur and afterwards cleansed and white-washed. Disinfectants were supplied gratis to inhabitants of the borough from May 8th to the end of August. After the latter date they were supplied to the hospital institutions only.

Drain flushing.—During continuance of the epidemic special gangs of men were employed in flushing, by means of fire-hose attached to street hydrants, the drains of houses invaded by fever. This was done daily in the majority of cases and at least three times weekly in the remainder.

Action by the East Preston Rural Sanitary Authority.

Similar precautions in the matter of warning inhabitants against drinking unboiled water or unboiled milk, and as regards disinfection and drain flushing, were observed in the villages of West Tarring and Broadwater. These places are devoid of hospital accommodation for infectious diseases and accordingly the following temporary arrangements were made. At West Tarring the Public Reading Room was on July 14th utilised for the reception of cases of enteric fever, and on August 9th the Infants' School was devoted to the same purpose. In all 32 patients were thus accommodated. At Broadwater the Public Reading Room was, on July 20th, employed for the reception of cases of enteric fever, of whom 22 were in this way accommodated.

The history that has been set forth of the severe outbreaks of enteric fever in the four areas of "Worthing," "West Worthing," West Tarring, and Broadwater, adds one more instance to the already lengthy list of examples of the disastrous consequences that may result from a specifically polluted public water supply. From it as matter of first instance and of chief importance, the several Sanitary Authorities should learn the necessity of supplying a water pure at its source and free from risk of pollution after collection and during delivery. To fulfil this end they cannot display too great energy in pushing on the works necessary for the provision of a pure supply of a permanent character. The present supply procured from the well near Broadwater village, while undoubtedly preferable to that which it has replaced, is nevertheless not one that can be regarded as beyond risk of contamination. It is too near the village of Broadwater and to other human habitations to be beyond suspicion of pollution. And indeed certain bacteriological analyses that have been made of the water supply by Dr. Klein, and of which an account is given in an addendum to this report (Addendum C.) suffice to show that the water contains impurities which are of a character raising suspicion that it may in its turn become specifically polluted so as to distribute disease throughout the area of its supply. It is therefore most desirable that a water of undoubted purity should be made available for use as soon as possible. Further, the avoidance of risk of local pollution of water mains should be a matter of the most serious care to the Sanitary Authorities of the districts concerned. That this is liable to occur in the case of an intermittent supply delivered through mains fitted with ball hydrants is unquestionable; and accordingly this matter should receive most careful consideration.

The sewerage arrangements of the several areas dealt with in this report are very unsatisfactory. In addition to the defective condition of many sewers in "Worthing" and "West Worthing," due to faults of construction and to insufficient fall, the two systems of sewers which serve "Worthing" "West Worthing" and West Tarring are tide-locked, and consequently sewage backs-up in them during large part of the 24 hours. In Broadwater, again, there is no proper system of sewerage at all; such drainage as exists being into cesspools or into fields and ditches. It is the duty of the respective Sanitary Authorities to remedy these defective conditions without delay. The need for action of this sort has been recognised by the Worthing Town Council who have made applications to the Board for sanction to a loan of 36,300*l.* for works of sewerage. Inquiry as to the matter of this application was on December 14th, 1893, made at Worthing by the Board's Engineer Inspector, Mr. Arnold Taylor.

ADDENDUM C.

App. A, No. 6.

On Enteric Fever in Worthing, Broadwater, and West Tarring; by Dr. Theodore Thomson.

Dr. Klein's Report.

SUMMARIES of Dr. Klein's Reports on Samples of "WORTHING" and of "WEST WORTHING" Waters submitted by him in 1893 to BACTERIOSCOPIC EXAMINATION.

The following samples of water were submitted to Dr. Klein for examination:—*

A. "Worthing" water supply, taken July 26th.
B. Do. do. taken August 8th.
C. "West Worthing" water supply, taken August 21st.
D. Do. do. do. do.
E. Do. do. taken December 7th.
F. "Worthing" *temporary* supply from Broadwater, taken Nov. 29th.
G. Do. do. do. do. taken Nov. 30th.
H. Do. do. do. do. taken Dec. 7th.
I. Do. do. do. do. do. do.
K. Do. do. do. do. do. do.

Methods of Examination.

The methods of examination resorted to were as follows. With the view of ascertaining the quantity of micro-organisms per cubic centimetre of the water under investigation the ordinary method of plate cultivations was employed. This plan consists of adding to nutrient gelatine in a fluid state a small quantity of water to be examined (the amount employed varying from one c.c. to a fraction thereof), shaking the mixture so as to aid distribution of the water throughout the gelatine, and then pouring the mixture on plates. These plates, on which the gelatine mixture solidifies, are then transferred to an incubator and maintained at a temperature of 20° C.; and by subsequent observation the number and nature of the organisms that grow on the gelatine are ascertained.

Another method was resorted to in searching for particular microbes in water from a given source, and for the following reasons:—

(*a.*) The bacillus coli and the enteric fever bacillus,, when present in drinking-water, exist there for the most part in relatively small proportion. Thus, if only a small quantity of water, such as one c.c., be examined, it is likely that the organism, sparingly present in the total bulk of water, may not be present in a small sample, although present in a larger bulk.

(*b.*) If the numbers of other micro-organisms amounts to several hundreds or more per c.c.—and this is usually the case when water is unfiltered—there is risk that the numerous colonies of these may on plate cultures obscure and prevent recognition of scantily present bacillus coli or enteric fever bacillus.

(*c.*) One of the bacteria most frequently found in water is the bacillus fluorescens liquescens, which grows much more rapidly than either the bacillus coli or the enteric fever bacillus, and liquefies gelatine very quickly. Abundance of the first-named bacillus in the water under examination would accordingly, by liquefaction of the gelatine mixture, tend to prevent detection of either of the last-named bacilli. With the view, therefore, of overcoming these difficulties the following means were adopted:

* In each case a gallon of water, collected in a clean jar, was sent for examination. Prior to collection of the sample the jar was rinsed with water from the source from which the sample was about to be taken.

(1.) A considerable bulk of water (from 1,500 to 2,500 c.c.) was submitted to examination. For this purpose the quantity to be examined was passed through a sterile Berkefeld filter, which retained on its outer surface all or nearly all the particulate matter contained in the water. The matter thus retained on this outer surface was then brushed with a sterile brush into 20 c.c. of sterilised water and mixed therewith. Of this mixture 1 c.c. was added to each of a series of gelatine plates and broth* tubes. Accordingly these tubes and plates contained all or nearly all the particulate matter of the total quantity of water selected for examination.

(2.) To prevent obscuring of the bacillus coli or the bacillus of enteric fever by other organisms that grow more rapidly than they, or that soon liquefy the gelatine, a small quantity of phenol was added to the culture media. For this purpose a 5 per cent. watery solution of phenol was used, and this solution was added to the culture media in the proportion of 1 of the former to 100 of the latter. The added phenol, which does not interfere in any way with the growth and multiplication of the bacillus coli or of the bacillus of enteric fever, exerts a marked inhibitory effect on such water bacteria as bacillus fluorescens liquescens, the proteus vulgaris, and others; and, by retardation or suppression in this way of growth of these latter organisms, better opportunity is afforded of detecting in waters examined the presence of the bacillus coli or of the bacillus of enteric fever.

The gelatine-plate and broth-tube cultures thus prepared, were incubated at a temperature of 20° C. and of 37° C. respectively. From growths of the bacillus coli or the enteric fever bacillus obtained in these ways sub-cultures were made in the ordinary manner.

Features characteristic of Bacillus Coli and of the Enteric Fever Bacillus.

Bacillus Coli.	Enteric Fever Bacillus.
Shorter and less mobile than the enteric fever bacillus.	Longer and more mobile than the bacillus coli.
Forms gas bubbles in gelatine shake culture.	Does not form gas bubbles in gelatine shake culture.
Curdles milk in 1–2 days at 37° C.	Does not curdle milk.
If grown in broth for several days forms indol.	Gives no indol reaction when grown in broth.

The above tabular statement embodies the chief distinctive features of the bacillus coli and the enteric fever bacillus, derived respectively from the contents of the healthy human intestine and from the tissues of enteric fever. Other points are as follows. In gelatine stab culture and in gelatine surface cultures these bacilli are alike in general appearance save in two respects, viz.: (*a.*) that the bacillus coli grows faster than the enteric fever bacillus, and (*b.*) that in gelatine stab-culture the former organism forms on the upper surface of the gelatine a larger plate-like growth than does the latter. On gelatine plates both organisms form on the surface of the culture medium colonies which present the appearance of flat, crenated, or irregularly outlined patches, thinner at the periphery than at the centre, translucent by transmitted light, greyish by reflected light; while colonies of both organisms, growing beneath the surface and embedded in the gelatine, are rounder than surface colonies, and appear of a brownish colour by transmitted light. Neither organism liquefies gelatine. Their growth on agar and on potato affords no definitely distinctive feature; although, as a rule, the bacillus coli forms on potato a brownish growth, while the bacillus of enteric fever forms on the same medium a colourless growth.

* Beef broth: alkaline: with one per cent. peptone and one per cent. salt added.

Reports on Waters submitted to Examination.

"Worthing" Water.

Sample A.—Taken on July 26th from well C of the "Worthing" waterworks.

Cultivations were made on four non-phenolated gelatine plates in the ordinary manner. In this way the following common water bacteria were isolated.

(*a.*) Bacillus fluorescens liquescens; found in all four plates.
(*b.*) Cocci, non-liquefying and liquefying; found in all four plates.
(*c.*) Bacillus mesentericus; found in three plates.
(*d.*) Proteus vulgaris; found in three plates.
(*e.*) Bacillus fluorescens putidus; found in two plates.

Cultivations in four phenolated broth tubes and six phenolated gelatine plates were made with the particulate residue of 2,500 c.c. of this water sample driven through a Berkefeld filter, and with result as follows. Six varieties of organisms were isolated, which presented the following features:—

(*a.*) All six formed gas bubbles in gelatine shake cultures.
(*b.*) Five coagulated milk rapidly; while one made the milk thick but did not produce complete coagulation.
(*c.*) Five gave the indol reaction; while one did not give this reaction.

The appearance of the colonies formed by each of these organisms on gelatine plates, their manner of growth in shake and stab cultures, and the morphological characters of the individual organisms forming these colonies were typical of bacillus-coli. At least five, accordingly, of these six organisms are to be regarded as bacillus-coli.

No enteric fever bacilli were isolated from this water.

Sample B.—Collected, on August 8th, drop by drop during a period of 12 hours from the raising main in the "Worthing" waterworks yard.* Of this water 1,500 c.c. were passed through a Berkefeld filter; and the particulate residue on the filter was distributed among several phenolated broth tubes and phenolated gelatine plates. In all these tubes and plates the bacillus-coli developed abundantly; and, in addition, a few other colonies were detected—two in one plate and one in another plate—which, on sub-culture, presented, morphologically, as well as culturally, all the characters of the enteric fever bacillus.

"West Worthing" Water.

Sample C.—Taken on August 21st from a house-tap connected directly with a main situated in a street within the area of "West Worthing" that showed exceptional prevalence of enteric fever. In this sample search was made only for the bacillus coli and the bacillus of enteric fever. Neither of these organisms was recovered from the cultures made.

Sample D.—Collected, on August 21st, drop by drop during a period of three hours from the rising main in the "West Worthing" waterworks yard. As in the case of Sample C, search was in this instance made only for bacillus coli and the enteric fever bacillus, and here also with negative results.

Sample E.—Taken, on December 9th, from a tap in a house situated in Brunswick Road, "West Worthing." This water was found to contain 230 microbes per c.c.; and of these microbes 50 were liquefying organisms.

* The water passing along these mains is derived from all the wells, tunnels, and headings in the "Worthing" waterworks yard, and includes, accordingly, water from well C and from the new heading.

Search was made for the bacillus coli and for the bacillus of enteric fever, but with negative results.*

Worthing Temporary Supply from Broadwater Well.

Sample F.—Taken from water mains in "Worthing" on November 29th, 1893. The water in the mains was derived from the new well at Broadwater.

With the view of estimating the number of microbes per c.c. of this water, cultivations were made on four ordinary gelatine plates, $\frac{1}{10}$ c.c. of the water being used for two of these and $\frac{1}{2}$ c.c. for the remaining two. As result it was found that microbes were present to the very large amount of 50,000 per c.c. Of these microbes from 10,000 to 12,000 were liquefying organisms. In searching for bacillus coli and the bacillus of enteric fever, 1,600 c.c. of water were employed. Among the colonies appearing in cultures made from the particulate residue of this water on the Berkefeld filter, some were observed which in aspect, size, and shape, bore a distant resemblance to one or other of the bacilli sought for: but, in sub-cultures, the growths that appeared from these did not show fundamental characters by which any one of them could be identified as either bacillus coli or the bacillus of enteric fever.

Sample G.—Taken, on November 30th, from the well at Broadwater from which was obtained the Worthing temporary supply. The procedure adopted in the case of this water was the same as that employed for Sample F. As in Sample F there were about 50,000 microbes per c.c.; but of these only some 60 or 80 were liquefying organisms, a proportion much smaller than obtained in Sample F. In Sample G organisms distantly resembling bacillus coli and the enteric fever bacillus were observed; but, as in the case of Sample F, these could not on sub-culture be identified as belonging to either of the species they resembled.

Sample H.—Taken, on December 7th, from the reservoir in the town in the "Worthing" waterworks yard. The water in this reservoir was at that time derived from the new well at Broadwater.

This water was ascertained to contain 8,800 microbes per c.c.; of these microbes 150 were liquefying organisms. Several colonies were also observed which bore resemblance to either the bacillus-coli or the bacillus of enteric fever; but none of these, on further examination by sub-culture, presented features characteristic of either of the species they resembled.

Sample I.—Taken, on December 7th, from a house tap in "Worthing." The water obtained from this tap was derived from the new well at Broadwater.

The number of microbes per c.c. of this water was found to be 600; and of these microbes 10 were liquefying organisms. Search for bacillus-coli and the bacillus of enteric fever revealed the presence of two colonies bearing resemblance to colonies of these organisms. They were, it should be noted, different in appearance from those noted in Sample H as also resembling bacillus-coli or the enteric fever bacillus. The organisms composing the two colonies found in Sample *I* resembled the bacillus of enteric fever in their great motility, in their size, in their inability to form gas bubbles, in their aspect when growing on gelatine, whether in its surface or in its substance, in the slowness of their growth, and in their inability to curdle milk or to form indol; but they differed

* On January 29th, 1894, while this report was passing through the press, three samples of the Broadwater supply and one of the "West Worthing" supply were forwarded to Dr. Klein for examination. Of the three samples of the Broadwater supply one was taken from the well at Broadwater, one from the reservoir in the "Worthing" water tower, and one from a main in "Worthing." The three last-mentioned waters contained respectively, 68 microbes per c.c., 912 microbes per c.c., and 164 microbes per c.c. The "West Worthing" water contained 196 microbes per c.c. In none of these four samples was any bacillus discovered presenting the fundamental cultural characters exhibited by the bacillus coli or the bacillus of enteric fever.

from the bacillus of enteric fever in not forming threads and chains, and in not growing at all well at 37° C. Therefore these organisms could not be regarded as enteric fever bacilli.

Dr. Klein's Report.

Sample K.—Taken, on December 7th, from a house tap in "Worthing." The water obtained from this tap was derived from a new well at Broadwater.

The number of microbes per c.c. of this water was found to be 600; among which were not observed any liquefying organisms. Search for the bacillus-coli and the bacillus of enteric fever revealed, in the cultures that were made, the presence of two colonies, exactly similar in the characters they presented to the two colonies described in connexion with Sample *I.**

* On January 29th, 1894, while this report was passing through the press, three samples of the Broadwater supply and one of the "West Worthing" supply were forwarded to Dr. Klein for examination. Of the three samples of the Broadwater supply one was taken from the well at Broadwater, one from the reservoir in the "Worthing" water tower, and one from a main in "Worthing." The three last-mentioned waters contained respectively, 68 microbes per c.c., 912 microbes per c.c., and 164 microbes per c.c. The "West Worthing" water contained 196 microbes per c.c. In none of these four samples was any bacillus discovered presenting the fundamental cultural characters exhibited by the bacillus coli or the bacillus of enteric fever.

B; WEST TARRING; BROADWATER.

ury of Borough of Worthing.

Line between Worthing and West Worthing.

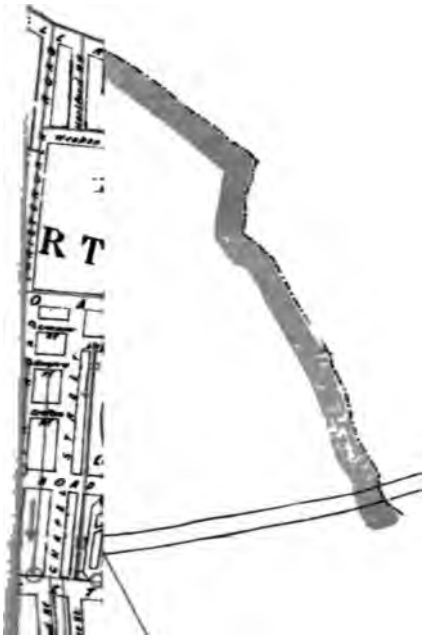
ays.

....., ..., ... Worthing Sewers.

....., ..., ... West Worthing Sewers.

....., ..., ... Manhole.

....., ..., ... Lamphole.



MAP 3.

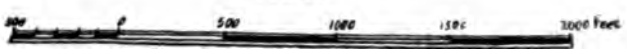
Borough of Worthing.

between Worthing & West Worthing.

Worthing, West Worthing, West Tarring, and

by Enteric Fever during the fortnight.

Scale.



ndary of Borough of Worthing.

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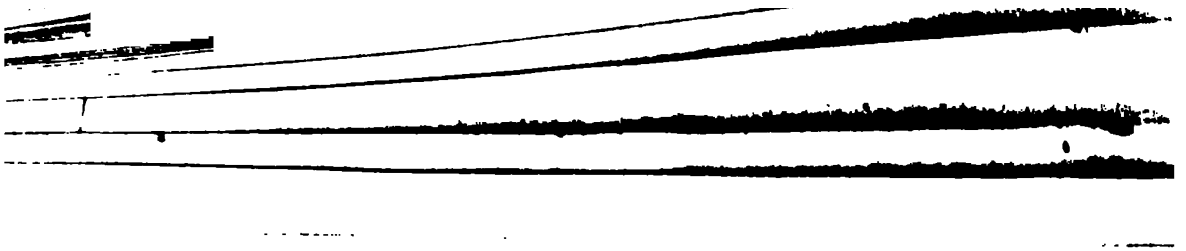
esident in Worthing, West Worthing, West Tarring, and

ter attacked by Enteric Fever during the fortnight.

Scale.



MAP 6.

· of Borough of Worthing.

· Line between Worthing & West Worthing.

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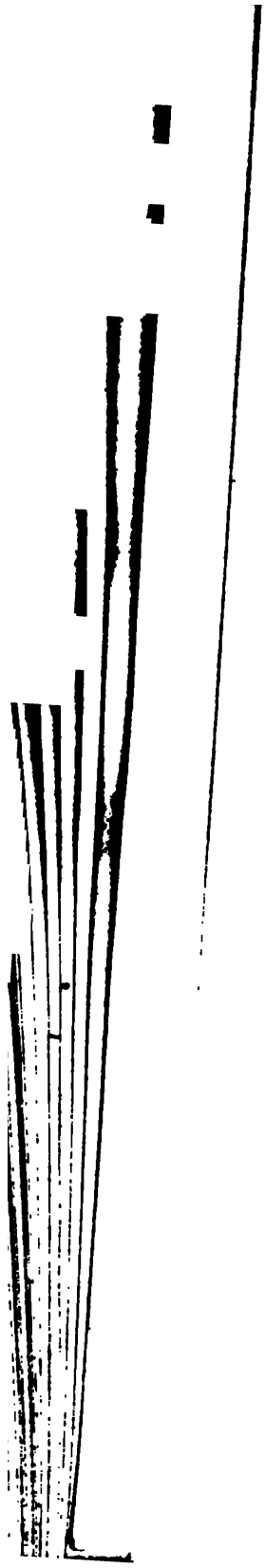
rt in Worthing, West Worthing, West Tarring, and

tacked by Enteric Fever during the fortnight.

Scale.

500 0 500 1000 1500 2000 feet



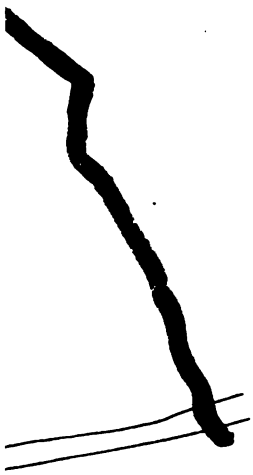
MAP 8.

of Borough of Worthing.

Line between Worthing & West Worthing.

in Worthing, West Worthing, West Tarring, and

ıcked by Enteric Fever during the fortnight.



Scale.

MAP II.

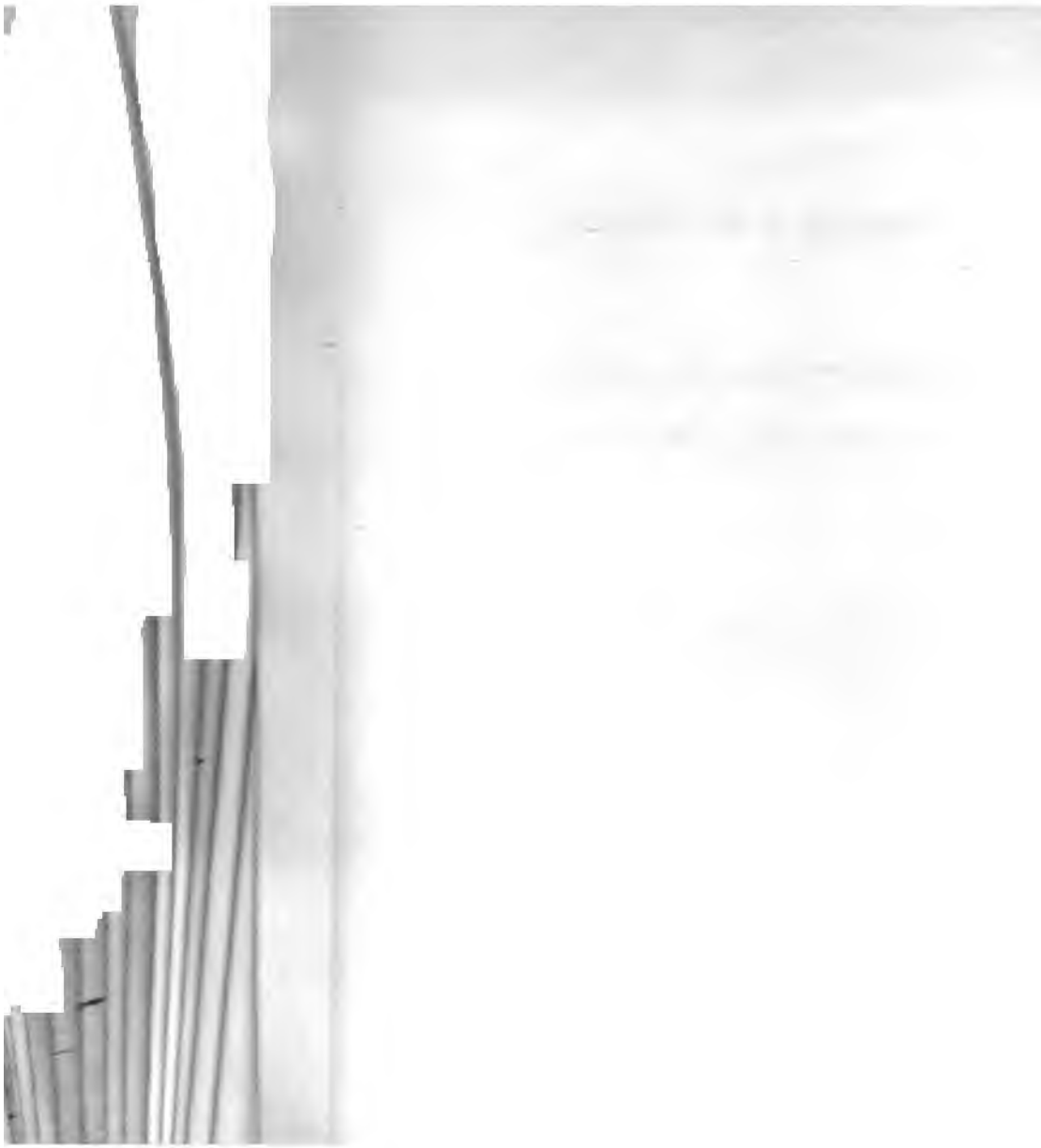
r of Borough of Worthing.

· Line between Worthing & West Worthing.

t in Worthing, West Worthing, West Tarring, and

acked by Enteric Fever during the fortnight.

Scale.



MAP 13.

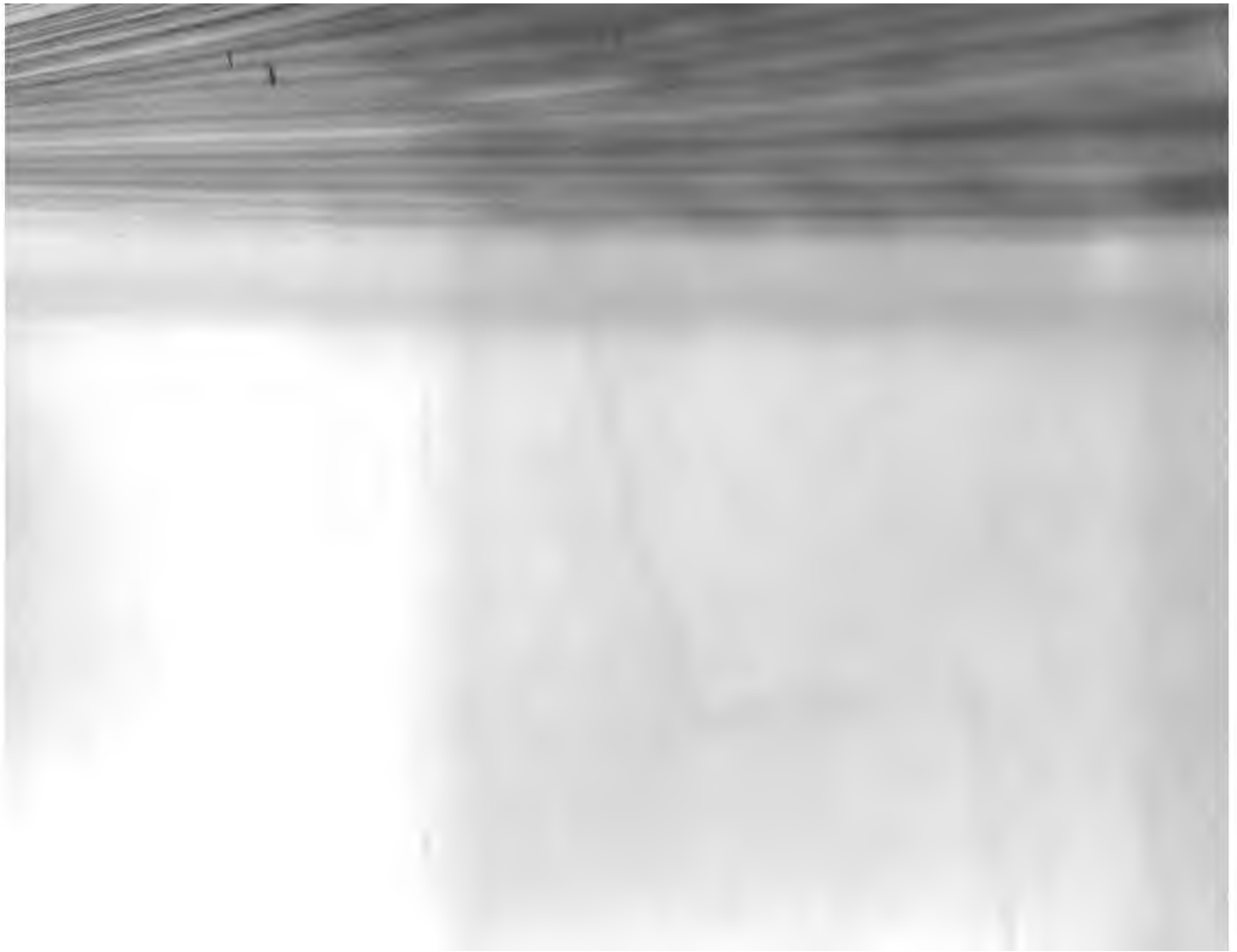
of Borough of Worthing.

Line between Worthing & West Worthing.

t in Worthing, West Worthing, West Tarring, and

acked by Enteric Fever during the fortnight.

Scale.



MAP 14.

y of Borough of Worthing.

y Line between Worthing & West Worthing.

t in Worthing, West Worthing, West Tarring, and

tacked by Enteric Fever during the fortnight.

Scale.

No. 7.

Report on an Outbreak of Enteric Fever at Chester-le-Street; by Dr. Maclean Wilson.

The Medical Officer of Health of Chester-le-Street Rural Sanitary District having reported a sudden outbreak of enteric fever at the village of Chester-le-Street, and having further intimated his belief that a public water service was concerned in the dissemination of the fever, this inquiry was ordered by the Board and I was instructed to make it.

Chester-le-Street is a very ancient village situated on the old post road between Durham and Newcastle, at a point where it crosses the Stanley Burn by a bridge. This stream is a tributary of the river Wear, which it joins a few hundred yards below the bridge. The oldest part of the village is on the south bank of the burn, and extends some two or three hundred yards southwards along the old post road, which here forms the main street. The newer houses lie on the confines of the village, some at the extreme south, some to the west of the main street, and others on the north bank of the burn. The village is now inhabited chiefly by coal-miners and their families, and as new pits have been opened out in the neighbourhood the population has rapidly increased from 3,350 in 1881 to 4,864 in 1891. The building of new houses has not kept pace with this increase in population, and as a consequence there is a good deal of overcrowding. It is said, indeed, that there is not a single empty house in the village, and that in several instances what were formerly single houses have now been divided into two or more tenements. The village has many of the sanitary defects of the old country hamlet as well as those of the modern pit village.

In the earlier part of 1892 two cases of enteric fever were notified (under the Act of 1889) to the Medical Officer of Health, one on the 16th April, the other on the 8th August. In each instance the patient had just come to the village, and seemingly had caught the disease elsewhere. On inquiry no connexion could be traced between these cases and those occurring later in the year.

Another case, notified on 8th October, was followed by three others in the same household; but, as will be afterwards seen, there are good reasons for attributing this family's illness to other cause than that producing the general outbreak.

From 14th November 1892 to 24th January 1893, 17 cases were notified, besides the three mentioned as following the October case. Then, after an interval of two or three weeks, came four cases on 10th February, three on 13th, three on 14th, and altogether 38 cases between 10th February and 19th March, after which there was cessation of the fever. In all, from October to Mid-March there were 43 families invaded, and there have occurred up to the date of inquiry 58 cases with four deaths.

The sufferers in this double outbreak were not persons residing in any particular part of the village, but were scattered over nearly every part of it, some in the more crowded and ancient houses in the centre, and some in the newer property at the upper end of the village and on the north bank of the stream.

The course of inquiry pursued was to trace if there was anything in common amongst the several patients which could possibly be the cause

of the fever, eliminating the cases of those who might be supposed catch the disease from others in the same family or from their neighbour and in doing this the various ways in which enteric fever may spre were considered under four heads:—Through personal contact wi patients or their excreta, through milk (or other food), through fau drainage arrangements, and through water supply. A table which giv details of the households invaded, with a statement of the facts asc tained under these four heads, will be found in the Addendum.

On inquiry respecting the 43 households attacked it was found th 10 might be set aside as probably infected in some other way than th through which the general outbreak arose. In the other 33 housebo the persons first attacked had nothing in common in their occupations a sort to lead to their falling victims to the infection. Of these persons 13 were pitmen, but they worked at four different pits, some them underground, others on the bank. Amongst the others were sch children of three different schools, housewives, a vagrant, a grocer clerk, a blacksmith, a moulder; in short, representatives of nearly ev working class in the village. It may, therefore, safely be assumed t the occupation of the patients was not the condition which was responsi for their catching the disease, nor was there anything in the way their social intercourse which afforded a satisfactory explanation.

The question of milk supply presented a little more difficulty. Twe of the 33 patients under discussion procured their milk from A., wh nephew was one of those suffering from the disease in February. I on inquiry it was found that there had been little intercourse betwe this boy's family and that of A., that he had never been to the cowsh or dairy, and that no one there had been ailing during the last ye On visiting A.'s cowsheds it was ascertained that they were overcrowd and badly ventilated, that the dairy or milk house was very unsuital for its purpose, being small, ill-ventilated, and badly lighted, and open close beside the door of a cowshed near to a small cesspool whi received the drainage from the stables. But it was also found that supplied the milk used at a large institution in the village, where n case of fever had occurred. That so many of the sufferers were A.'s customers is easily accounted for by the fact that A.'s dairy is much the largest in the village, the milk of 24 cows being distributed from i daily. D.'s milk supply also came under some suspicion, as D. was i the habit of visiting one of the patients when he was ill; but as only tw others of those attacked used D.'s milk, and as there were many oth customers who did not suffer, it is not at all likely that infection wa disseminated by it. There were altogether nine milk supplies patronise by these 33 patients, so it is evident that the milk did not form a comm source of infection.

The sanitary defects of the dwellings might possibly be thought of the cause of this outbreak of fever, for sanitary defects were present i the majority of the houses invaded; but the most glaring were i connexion with the 10 cases which have been set aside, and even i those instances the persons who suffered were seldom those most expose to the evil, as will be seen from the notes to the table. Among th other 33 invasions many of the houses were in fair sanitary order, the were scattered in all parts of the village, and few or none had any direc connexion with the town sewers; so that nothing in this direction coul lead one to suppose that the epidemic was due to faulty sanitar arrangements.

There remained only the water supply; and with regard to this th fact at once appeared that, with two exceptions, every household

seems to have been made when the company was first formed, and to have been much disturbed since, except for renewal of sand in a presently to be described; at any rate, I am told that it has not opened out for the last 13 years. It is constructed of brick and mo forming a tank 24½ feet by 49½ feet, and of unknown depth. Surroun it on three sides in the form of a horseshoe is the service reser covered in, and, I am told, constructed of brickwork with a coatin cement. It is said that the filtered water enters this reservoir thr holes in the walls of the filter bed. The filtering medium is s consist of 4 or 5 feet of gravel and fine sand, with a layer of cobbles at the bottom of the tank, but, as will be seen, the thickness of the varies immensely at different times. This is the method followe Once a year, after the clogged surface layer of sand has been rem about 150 cartloads of fresh sand are poured in. This sand is pro from the banks of the Wear close by, having been deposited by f and the Weir above this point receives the untreated sewage of a population both urban and rural. The water is turned on to the bed and allowed to run through it until the surface layer of sand h to get clogged, a period which varies from ten days to three w according to the state of the water. The water is then turned off the bed allowed to dry, when the man in charge skims off about an of mud and sand, and delves the new surface to a depth of a foot The water is again turned on, and the same process is repeated thro out the year until the sand has been in the main removed, when an 150 cartloads have to be filled in. The process of paring the su of the filter was done in my presence, and I was told that the lev the sand was then at its lowest, as it was time for its periodic ren At that time the surface of the filter was 5 feet 5 inches belov level of the overflow pipe, and I was told that 3½ feet of additional was to be thrown in, so that the thickness of the filtering medium w as much as 3½ feet. As has been noted above, the filter bed is surrou on three sides by the reservoir; on the fourth side is well manured gar ground, extending up to the wall of the filter bed, and as the wa made apparently of ordinary bricks and mortar, and is *dilapidated* many places, there is no doubt but that in time of *heavy rainfall* t soakage from this garden gets into the filter bed. The reservoir is su to contain sufficient water to last for a fortnight if the supply is turn off at night. On the town side of the reservoir is the valve pit c taining the pipe from the stream to the filter bed, as well as the dis bution main from the reservoir to the town, and these two are joi together by another short main, so that the water from the burn ca turned into the town without passing through the filter bed. T however, is said never to be done.

On examination of the Stanley Burn above the intake, nume pollutions of the water were seen. The chief were at Alma Pit Ho and Boundary Cottages (some 40 tenements); at Craghead, where sewage of 20 or 30 houses runs directly into the stream, and also effluent from a small sewage farm, which receives the sewage of 7 80 houses; and at Southmoor where 100 houses drain directly in tributary, and another group of 150 houses send their sewage, after imperfect treatment by irrigation, to join the main stream. Altoget the Medical Officer of Health estimates that the sewage of a popula of 3,500 persons passes directly or indirectly into the Stanley Burn its tributaries, above the intake of the Chester-le-Street Comp about half of this sewage being thus disposed of without any attem purification.

ALGENICUM

The following table gives the cases of [illegible] in this district during the year, with particulars as to the age of the patient and the occupation, water supply, and milk supply for the cases [illegible] :—

Number of case	Date of Notification	Total Attacks in Household	Age and occupation of the sufferer.	Water Supply.	Milk Supply.
*1.	[illegible]	4	14. Farmer -	Consett -	A. and
2	[illegible]	1	23. Pitman -	Chester -	C.
3	[illegible]	4	20. " -	" -	C.
4	[illegible]	1	25. " -	" -	D.
5	[illegible]	1	29. Clerk -	" -	D.
6	[illegible]	2	11. Schoolgirl -	" -	D.
7	[illegible]	1	13. Pitman -	" -	Preserved
8	[illegible]	1	16. " -	" -	B.
9	[illegible]	1	41. Housewife -	" -	E.
10	[illegible]	1	26. Blacksmith -	" -	?
11	[illegible]	1	24. Pitman -	" -	A.
*12	[illegible]	1	41. Housewife -	Consett -	?
13	[illegible]	1	17. Pitman -	Chester -	?
14	[illegible] February	2	21. Housewife -	" -	A.
15	[illegible]	1	14. Schoolboy -	" -	E.
*16	[illegible]	1	16. Domestic servant	" -	A.
*17	[illegible]	1	21. Housewife -	" -	Preserved
*18	[illegible]	2	3. Infant -	" -	A.
19	[illegible]	1	24. Pitman -	" -	A.
20	[illegible]	1	25. " -	" -	A.
21	[illegible]	1	7. Schoolgirl -	" -	A.
22	[illegible]	1	Housewife -	" -	E.
*23	[illegible]	1	2[illegible]. Pitman -	" -	E.
24	[illegible]	1	[illegible] Schoolboy -	" -	A.
*25	[illegible]	1	[illegible]. Pitman -	" -	C.
26	[illegible]	1	24. Pitman -	" -	?
27	[illegible]	1	14. Pitman -	" -	A.
28	[illegible]	1	[illegible] Schoolboy -	" -	Preserved
29	[illegible]	4	18. Pitman -	" -	E.
*30	24th "	1	12. Schoolgirl -	" -	G.
31	25th "	1	10. " -	" -	H.
32	25th "	1	41. Mother -	" -	A.
33	25th "	1	18. Pitman -	" -	A.
34	26th "	1	1[illegible] Schoolboy -	" -	B.
*35	28th "	1	16. Girl at home -	" -	A. and
36	28th "	1	16. " -	" -	A.
37	5th March	2	36. Pitman -	" -	A.
38	5th "	1	26. Housewife -	" -	G.
39	5th "	1	8. Schoolgirl -	" -	A.
40	7th "	1	27. Housewife -	" -	Preserved
*41	11th "	1	10. Schoolgirl -	" -	?
42	14th "	1	23. Housewife -	" -	B.
43	16th "	1	25. Grocer -	" -	F.

The cases marked with an asterisk are those in which there was so reason to suspect a source of infection other than that causing fever in majority of sufferers.

(35.) Washed for (1); and used the same privy-midden as (8), but lived at a good distance from it.

(39.) Lives in a house which has a privy-midden against the wall, and which is damp from soakage.

(41.) Lives in a house, against the wall of which is placed the privy midden used by (19), (21), and (30). Here again there was evidence of the liquid contents of the midden soaking through the walls.

(42.) Has a stable adjoining her house and a midden of large size within four yards of her window.

(43.) Uses the same privy-midden as (22).

few dwellings of a more modern kind have been built. *There is* no proper *sewerage*; slops find their way by gutters or other channels into the highway drain at the lower part of the village, and this *in turn* empties itself into the river. *Excrement disposal* is by means of midden privies situated usually in gardens or backyards. Some privy pits are sunk two feet or more below the surface of the ground. Refuse disposal is by uncovered ashpits or middens connected with the privies. At the date of my visit some of these privies and ashpits were in a neglected state. The middens are emptied by some of the occupiers twice a year, in spring and autumn; other persons, however, get rid of their refuse once a year only, and occasionally even this period is exceeded. The contents of the ashpits and privies are disposed of upon gardens and allotments near the village. *The water supply* is for the most part drawn by hand from the River Rye, at a point just above the village. There are, however, four private pump wells situate in the lower part of Nunnington, not far from the river's bank. One of these pump wells is resorted to by a number of householders who have received permission to use the water. This well is 27 yards from the Rye, and its depth is only seven feet. The water in it stands 3 feet from the surface of the ground. The well is only loosely covered by flags, through which surface water can easily pass; moreover, the well is merely dry steined, the joints being uncemented. There is a large midden privy within 14 yards of this well; and about seven yards from it is a slop drain and gulley. The other private wells are somewhat similarly situated, but they are mostly used by single households. The majority of the inhabitants of Nunnington, however, drink the river water. The churchyard is situated at the higher part of the village, on the slope above it. The people are engaged in agricultural pursuits. The geological formation on which Nunnington is built is the Middle Oolite. Close to the river there is alluvium and gravel.

Ness, in the Rural Sanitary District of Kirkbymoorside, is situated on the south bank of the Rye. It is a mile or so below Nunnington, at the base of the spur of the Hambleton Range, which here abuts on the river. At the last census, Ness township had a population *of 95 in* 21 inhabited houses. The area of the township is 1,317 acres, *and its* rateable value is 1,537*l*. The sanitary condition of Ness resembles that of Nunnington. Some cottages are damp. There is no sewerage; slop water is thrown out into the road, or to the roots of bushes in the gardens. The excrement disposal is by midden privies emptied at intervals on garden land. The occupier of the house in Ness furthest up stream has drained his privy midden and cow stable into the Rye at a point about 20 yards above a spot where some of the villagers draw their drinking water from the river. Though the majority of the inhabitants drink river water, there are several wells, which are sunk in porous soil near the river. When the latter is in flood the level of the water in the wells is raised. These wells are unprotected from soakage.

Butterwick, in the Malton Rural Sanitary District, is also on the south bank of the Rye about three miles below Ness. This village is built on alluvial soil adjoining the river. At the census of 1891 the inhabitants of the township numbered 69, and the inhabited houses were 13; its area is 500 acres, and its rateable value 802*l*. There is no sewerage. Midden privies are in use as at Nunnington and Ness. Drinking water is mostly taken from the river, but some farm-houses standing back from the Rye have private pump wells.

TABLE I.—SHOWING cases of ENTERIC FEVER and of illness of similar sort occurring at NUNNINGTON, NESS, BUTTERWICK, and BRAWBY, during the months of NOVEMBER and DECEMBER, 1892, and JANUARY, 1893.

——	Population 1891.	1892.			1893.		Totals.
		October.	November.	December.	January.	February.	
Nunnington	354	—	4	10	7	—	21*
Ness -	95	—	—	1	1	—	2
Butterwick	69	—	—	1	—	—	1
Brawby -	148	—	5	2	—	—	7
	666	—	9	14	8†	—	31

* Two of these died.

† Six of these were secondary cases in houses already invaded in November or December.

The age and sex of the persons attacked are shown in Table II.

TABLE II.—Showing Age and Sex of ASCERTAINED ATTACKS of ENTERIC FEVER and of similar illness in Persons resident at NUNNINGTON, NESS, BUTTERWICK, and BRAWBY from NOVEMBER 1892 to JANUARY 1893.

——	Under 5.	5 to 10.	10 to 15	15 to 25.	25 to 60.	Total.
Males - -	4	2	6	3	5	20
Females - -	2	2	1	1	5	11
	6	4	7	4	10	31

The notification of infectious diseases is at present in force in the Kirkbymoorside and Malton Rural Sanitary Districts. Notification, however, had only become compulsory in the former district a few months before the outbreak. I was informed by the practitioners who attended the cases at Nunnington that they were unaware of the adoption of the Notification Act by the Kirkbymoorside Authority; no certificate forms had, they said, been supplied to them. In consequence, none of the earlier cases were notified. The outbreak only came under the notice of Dr. Muil, the Medical Officer of Health, through his being called in professionally to attend one of the fever cases at Nunnington about the middle of December.

All the cases were treated at their homes; neither of the Sanitary Authorities has provided any hospital for the isolation and treatment of such cases. At Nunnington and Ness Dr. Muil caused bills to be distributed among the householders and posted also in public places, calling attention to the urgent necessity for boiling the river water before drinking it. Disinfectant in the form of carbolic acid was supplied for mixing with the excreta. The nuisance inspector was instructed to make a house-to-house visitation at Nunnington, and to cause all accumulations of filth and other refuse to be removed from the neigh-

Table IV. shows deaths from enteric fever in Leeds from 1882 to 1892 inclusive:—

——	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.
Enteric fever deaths in Leeds.	149	123	145	74	99	103	53	129	112	73	64

I learn that during 1890, though notification was not in force, 205 cases of enteric fever were investigated by the officials of the Health Department at Leeds; during 1891, 221 cases, and during 1892, 189 cases.

3. The manuring by the people of Nunnington themselves of gardens, allotments, and fields with privy contents, may have polluted the river with the specific poison of enteric fever. In a previous part of this report I mentioned that a group of at least five cases of fever occurred at Nunnington in April and May 1892. The stools of the patients at the commencement of the illness, if not later, were disposed of in the privies. It is the custom here to clean out some at least of these privy middens in the autumn and early winter; the "muck," as it is termed, being spread upon land. The allotments of the Nunnington people, and most of the land cultivated by the farmers of the village, lie "up stream," and more or less adjoining the river. On one side of the river at least the slope of the land is highly favourable for the washing of manure in wet seasons from the land to the river.

The River Rye then is liable to specific pollution not only by means of the sewage of Helmsley, but also through the manuring of fields and gardens with excrement from local privies. Similarly it is liable to contamination by the night soil brought by rail from Leeds, and spread on land bordering the river.

It remains to note conditions under which enteric fever poison, whether contained in filth accumulations in water-courses tributary to the Rye or pent up in manure deposited on land in the neighbourhood of that river, could become conveyed into the stream, in ways to account for both the sudden outbreak in November of enteric fever in the riverside villages, and the renewal of the disease in them from time to time during December and January.

Through the kindness of Mr. E. K. Spiegelhalter, of Malton, F.R. Met. Soc., I was able to obtain the meteorological data for the year 1892 and particularly for the last quarter of the year (*see* Addendum). It appears that the month of October was exceedingly wet, no less a quantity than 5·61 inches of rain being measured during that month. Of this total amount, 2·88 inches fell within 41 hours (from October 13th to 15th), 1·80 inches of it falling on the 14th. The result of this sudden and heavy rainfall was that all the streams in the district were flooded, and the low country was in places laid under water.

No doubt a large amount of filth from a wide area thus at once found its way into the Rye, at the same time that similar filth became deposited as mud and slime on the submerged alluvial flats bordering the river, especially in places where the current did not run strongly or where the water was practically stationary. This deposit of mud and slime would gradually by subsequent rains be also washed into the river, re-polluting it from time to time till all was washed away.

ADDENDUM.

Summary of Rainfall for 1892, at Norton, Malton, taken by E. K. Spiegelhalter, Esq., F.R.M.S.

Rain Gauge { Diameter of funnel, 5 inches. Height of Top { Above ground, 1 foot. Above sea-level, 66 feet.

Month.	Total Depth.	Greatest Fall, 24 hours.		Number of Days in which ·01 or more fell.
	Inches.	Depth.	Date.	
January - -	1·41	·46	11th	11
February - -	1·90	·50	20th	18
March - -	·96	·25	12th	13
April - - -	1·76	·92	27th	13
May - - -	3·60	1·20	27th	21
June - - -	4·45	1·52	28th	18
July - - -	1·41	·87	19th	9
August - - -	2·64	·81	29th	16
September - -	1·54	·40	29th	12
October - - -	5·61	1·80	14th	26
November - -	1·63	·39	4th	16
December - -	1·26	·51	9th	11
Total - -	28·17	—	—	184

MAP
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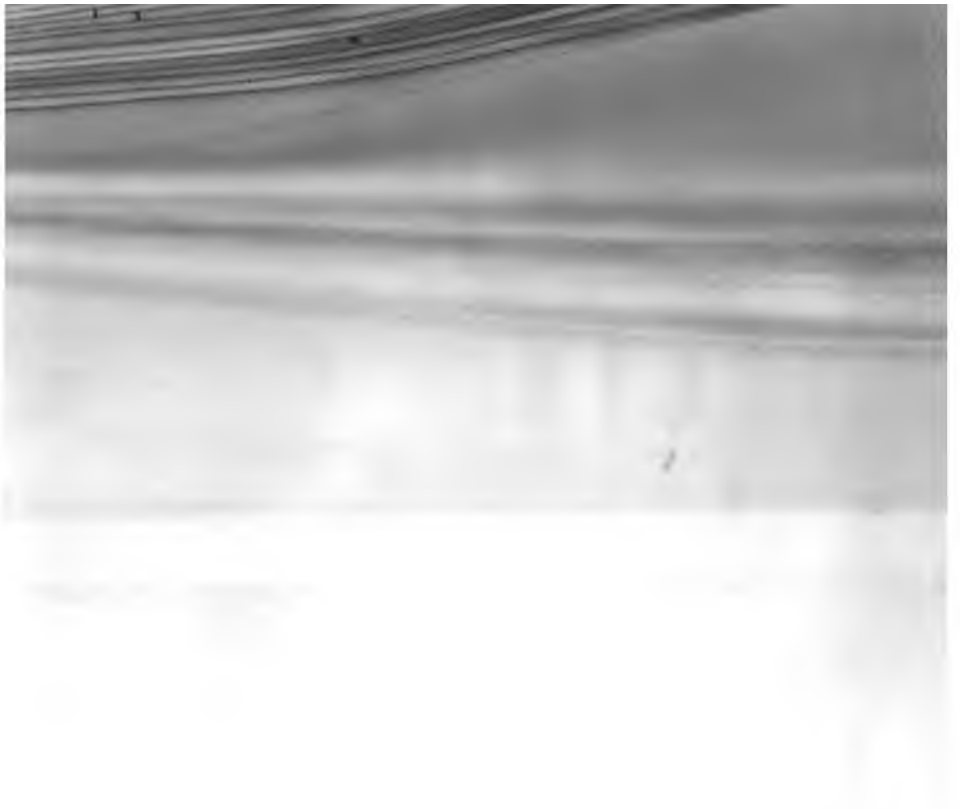
Sproxton
Low Beloma
Kirkby Misperton
Pickering
Little Barugh
Great Barugh
Low Moor
Great Habton
Old Malton
NEW MALTON
Amotherby
Swinton
Broughton
Swinton Field
The Ings
Low Moor
Old Malton Fields
Swinton Ings
Brownmoor
Hazel Hr.
Barfondale Ho.
Rainbow Ho.
Sparrow Hall
Ryton Grange
Manor Ho.
Ryton
Habton Grange
Little Habton
Gillin
Pack
Middlecale
Flowery Hill
Quarries
Station
Hospital
Old Malton Mill



the river are other canals, affording access for barges to Birmingham and other Midland towns.

Almost from its source the Trent becomes polluted with sewage. The river and several of its tributaries constitute the natural drainage of nearly the whole of Staffordshire. In its passage through the densely populated pottery district the Trent is admittedly polluted, and lower down the crude sewage of many places, and as well the effluents from sewage farms, mingle with the waters of the Trent and its tributaries. Taking two tributaries as samples of the others, the Tame, which receives sewage from Birmingham more especially at times of heavy rainfall and from the Black Country, is highly polluted; and lower down, the Derwent, which flows through the centre of Derbyshire to the Trent, receives the crude sewage of such places as Bakewell, Matlock Bridge, Matlock Bath, Belper, Derby, Alvaston and Boulton, having a combined population of nearly 120,000. The sewage of Nottingham is disposed of upon land adjoining the Trent at Burton Joyce, about five miles from the town and about 18 miles above Newark. The effluent, owing to the care which has been, and is being, taken with the preparation of the land used as a sewage farm, is, under ordinary circumstances, clear and free from objectionable smell. But in times of heavy rainfall it is found necessary to turn the contents of the flooded sewers of Nottingham direct into the Trent. In this and other ways much untreated sewage at times reaches the river. Still lower down the crude sewage of Newark passes directly into the Trent, and further down still the town of Gainsborough discharges its sewage into the river. In addition to the towns last mentioned, the whole of the intervening places on the river drain into the Trent without any attempt at purification of their sewage.

Into the lower section of the river, with which this report is more especially concerned, there is drained a considerable area of heavily manured land; so that after heavy rains the river is contaminated by the washing into it of more or less towns' manure and night soil, imported from large urban districts. The town of Nottingham, for example, where the pail system is still in use, has to dispose of more than a thousand tons of night soil every week. Much of it is taken by boats to neighbouring districts, the natural drainage of which is to the river. Such manure would be liable at any time to contain the bowel discharges of enteric fever patients, and of persons suffering from diarrhœa.

As bearing on this point I give in the subjoined tables the recorded cases and deaths from enteric fever and diarrhœa in Nottingham for some years back. The figures are taken from the annual reports of Dr. Boobbyer, the present Medical Officer of Health, and from those of his predecessor.

Table I.—Showing notified* Cases of Enteric Fever, and Deaths therefrom, in the Borough of Nottingham, from 1884 to 1892 inclusive. Population (in 1891,) 211,984.

Enteric Fever.	1884.	1885.	1886	1887.	1888.	1889.	1890.	1891.	1892.
Cases - -	218	325	317	411	426	395	348	396	200
Deaths -	68	61	74	89	87	66	58	70	32

* Notification came into force in June 1883.

outfalls. The number of waterclosets in this town is on the increase, and the direct excremental pollution of the Trent from this source, only a few miles above certain villages which draw their drinking water from the river, is, to a corresponding extent, augmented also. Hitherto, for the artisan population at Gainsborough, midden privies, mostly of the old objectionable kind, have been in use; but in connexion with houses recently erected, trough closets and other forms of waterclosets have been provided. The contents of the midden privies, as in the other towns already mentioned, are sold for manure to farmers and others in the neighbourhood. With regard to the possibility of the Gainsborough sewage and night soil being specifically contaminated with the poison of enteric fever I have been unable, for various reasons, to obtain much definite information. Owing to the circumstances under which the Medical Officer of Health for the Gainsborough Urban District is appointed, no copies of his annual reports are sent to the Local Government Board, and consequently I could obtain no record of any past epidemics of fever in the town. From resident medical men, and from other persons, I gathered that cases fatal and non-fatal of enteric fever have occurred in Gainsborough, more or less, every year, and that there were 11 fatal cases in 1891. I also learned that during 1892 the district nurses had on their books, mostly during the autumn months, and among the poorer classes in Gainsborough, at least 23 enteric fever cases, as well as other milder cases of a suspicious nature. There were also some cases in the early part of 1893. From these facts it would seem that the town of Gainsborough has added its share of specific pollution to the water of the River Trent.

Below Gainsborough the Trent receives the sewage of some large villages, *e.g.*, Morton, Stockwith, and Owston, situated on its banks. At West Stockwith, and also at East Stockwith, are chemical works, where artificial manures and other products are prepared. The waste water from these works escapes into the river above the villages of East and West Stockwith. At the date of my visit the works were not in full operation, but I saw some dark brown fluid discharging into the river. However harmless the effluent may have been, yet the presence of chemical waste from trade processes in a drinking water is not, to say the least, desirable.

At West Stockwith the River Idle joins the Trent. Into the Idle the untreated sewage of the Borough of East Retford passes some 18 miles higher up. The Idle is further polluted by the drainage of a large tract of land, highly cultivated and heavily manured, between Retford and West Stockwith. As regards the Idle, and the large dykes or drains entering the Trent hereabouts, it is customary in summer time, when cutting down the rank growth of weeds growing on the banks, to throw them into the water as the quickest and easiest way of disposing of them. When these collections of weeds enter the Trent they are carried up and down the river by the tide, and as other impurities (occasionally a dead dog or cat) get attached to them, the smell from these collections becomes very offensive, especially in hot weather and when the amount of water in the river is low. Those who live in villages lower down, below Stockwith, complain very much of the nuisance arising from these collections of floating weeds and dirt. One farmer went so far as to say that at times the Trent actually stank from this cause.

In the addendum to my report on the water supplies of the Gainsborough Rural District will be found copies of reports* on some analyses

* Not here reproduced.

Eight villages in the Gainsborough Rural District (see report on water supplies of the Gainsborough Rural District at page 110) derive their drinking water mainly from the Trent, as also do two villages in

MAP SHOWING THE COURSE OF THE TRENT AND ITS PRINCIPAL TRIBUTARIES

THROUGH 5 COUNTIES FROM ITS SOURCE TO ITS FALL INTO THE HUMBER.

Scale 8 Miles to 1 Inch.

To face page 8

the Thorne Rural District (*see* report on water supplies of the Thorne Rural Sanitary District at page 131).

There are also two villages in the Glanford Brigg Rural Sanitary District, which make use of water from the River Trent for domestic purposes, viz., Burringham (population at census of 1891, 565) and East Butterwick (population in 1891, 274). These villages in addition to the river water, use rain water collected in underground cisterns from the roofs of houses. There are also surface wells in many of the back yards. The water in these is hard and seldom used for drinking. Trent water is boiled before use in these two villages, and to this precaution may possibly be due the apparent immunity of the inhabitants from enteric fever. Since 1886, there have only been, so far as is known, two cases of enteric fever in Burringham, both occurring in 1888, and only one case in East Butterwick, and this occurred in 1886. For information regarding these two villages I am indebted to Mr. Maximilian Behrendt, of Burringham, the resident practitioner.

With regard to the incidence of enteric fever upon residents in riverside villages, Mr. T. B. F. Eminson, of Scotter, who, in his own person and in that of other medical members of his family, has a large and varied acquaintance with the habits and customs of the locality, including the Trentside, expresses an opinion that enteric fever more commonly attacks new comers who drink Trent water, than those who have been drinking it for years. His explanation is that, in all probability many native Trentsiders have had enteric fever in early life, and that, perhaps, the constant use of Trent water by those who have not had the fever, enables them in some way to resist more or less this disease.

Though public opinion in towns is sufficiently advanced to recognise the danger of using a polluted water supply, it is unfortunately the case that in rural districts, and more especially in the Trentside villages, there is a strong feeling against the disuse of the river supply and the substitution of a new one. Apart from the question of expense, and the ignorance of the ill effects produced by contaminated water, there is in the district a deep rooted confidence in the qualities of Trent water, and an unconcealed aversion to listen to any representations as to possible dangers arising from its use. The medical men practising in the district are constantly urging the boiling of river water before use, and to this precaution, I think, in some measure is due the fact that there has not been a still greater incidence of enteric fever in recent years in these riverside villages.

It is of interest to mention that sand and gravel are taken from the river bed between Newark and Gainsborough and removed to towns for renewing the filtering materials of some public water supplies. Unless previous to use these materials are subjected to careful preparation, they might themselves become a source of danger.

Should cholera be introduced into this country at any time, and be carried to any of the towns or villages situated on the banks of the Trent or its numerous tributaries, the people who drink Trent water lower down would be in danger of catching the disease. I am informed that in some previous cholera visitations the Trentside populations suffered heavily. Attached is a map showing the course of the Trent and some of its tributaries.

sewer in the same manner. No manholes or lamp holes at bends or junctions have been provided for inspection purposes. Usually no arrangements for flushing the sewers have been made; but at Owston Ferry, where the sewer is an old square-shaped one, built of brick, and with little or no gradient, there is a contrivance by which at high tide water can be admitted from the river into one section of the sewer, permitting a free flush from end to end, when desired. A few houses at Misterton drain direct into the Chesterfield Canal. In some places house drainage is imperfect; occasionally slops are conveyed away in open channels. Trapped gulleys were sometimes seen outside the dwellings for the reception of the house slops; but small shallow metal traps were more commonly met with. Where no sewers are provided each house drains into the nearest ditch, or sometimes into a cesspool in the garden.

Excrement disposal is mainly by midden-privies, most of them of defective construction. Many privies discharge into large uncovered middens, which retain for long periods considerable accumulations of filth and refuse. Privies are sometimes dilapidated, some are without doors. Nearly all permit the dripping of rain water from their roofs to pass direct into the middens. Occasionally, owing to want of spouting on the adjoining buildings, the storm water therefrom runs into the midden pit. Some privies are too close to dwellings. One midden, for example, at West Stockwith, is only 4 feet from a house, the privy door facing the pantry. Into this midden, four privies (used by eight houses) discharge. It is uncovered, is sunk 3 feet or more below the surface of the ground, and measures 8 feet long by 5 feet wide. Slop water is thrown occasionally into these midden pits, the bottom of which is seldom water tight. A few houses, at Morton for example, have moveable receptacles in their closets, but owing either to apathy on the part of the occupier, or to the want of suitable opportunities for disposing of the contents, those that I saw were not always in good order.

The removal of House Refuse is cast upon the occupier, and it would seem, judging from results, that in the opinion of the occupier, the larger the midden the less frequent the trouble of getting it emptied. I saw numbers of middens in urgent need of emptying. In some instances inquiry elicited the fact that the occupier had no garden or allotment on which to dispose of his refuse, and that he was thus at the mercy of the farmer, who would only remove the refuse when it suited his own convenience. Some householders in riverside villages throw their refuse direct into the Trent, or dispose of it upon the river banks from which it is carried away by high tides. For some cottage property no ashpits of any kind are provided, and house refuse is heaped in the backyard.

Pigs are sometimes kept too close to houses. Some sties at the time of my visit were in a wet and neglected state, and from their proximity to wells endangered local water supplies.

Water supply.—Throughout the whole district, this is in a large measure derived from pump wells, one for each house or group of houses. The wells vary in depth, some being not more than 10 feet deep, while one at Lea is 50 feet deep. The average depth is from 15 to 20 feet. Many of them from their situation are liable to contamination owing to soakage into them of liquid from privy pits, middens, and pigsties. Where the position of the well has been properly chosen, and [illegible]e are no filth accumulations near at hand, these wells ap[illegible]ur[illegible]y; but a large number are not so situated [illegible]s [illegible]f pollution. Some wells at Morton, for [illegible]fter heavy rains. Some outlying cottages

in Kexby parish get their water supply from a land drain. This water, I was assured, is always boiled before use.

The village of Misterton derives its water supply in large part from the Chesterfield Canal, and a small portion of the parish of Walkeringham does the same. This canal joins the Trent at West Stockwith about a mile from Misterton. The water in the canal is polluted. A considerable amount of nightsoil manure is brought into the canal, by barges, from Lincoln and Gainsborough in the one direction, and from Retford in the other. A good part of this manure is unloaded on the banks of the canal, and pollution of the water takes place in the process. At Misterton there are some pump wells, and also rain water is stored in cisterns by some persons, but the majority of the people use the canal water; some boil it, but others do not.

None of the villagers on the riverside above Gainsborough drink Trent water, though persons (eel-fishers with their families, and others) living in house boats and moored off one or another of the riverside villages habitually use it. The more or less habitual use in the Gainsborough Rural District of Trent water for domestic purposes, is limited to eight villages all situated below the town of Gainsborough. Their combined population at the last census amounted to 3,530, of whom 878 live in five small villages on the east bank of the Trent; and 2,652 in three larger villages on the west bank. The first group comprises the villages of Walkerith, East Stockwith, Wildsworth, East Ferry, and Susworth, while the second group consists of West Stockwith, Owston Ferry, and West Butterwick. (For population of each village see Table III., pages 117–18.)

The water when drawn from the Trent is brown or yellowish-brown in colour, and somewhat muddy looking. It is commonly set aside for a time by the householders to stand in large jars holding six or eight gallons or more, to allow the abundant suspended matter to settle. After this it is usually boiled before use. Some persons after boiling filter it, others only filter it without boiling; while there are people who neither boil nor filter the water, resting content to use it after allowing the suspended matter to subside. Even in households where the Trent water is habitually boiled before use, it is admitted that there are occasions when this precaution, for various reasons, is omitted. In one village, Susworth, it is the custom of some to add a little alum to the muddy water, to hasten the settling down of the sediment to the bottom of the jar.

The filters in use in these villages are generally made of carbon, or of sandstone. While some persons are careful to clean their filters regularly, others take little trouble with them; one man indeed confessed to me that his filter had not been cleaned for two years. Several of the filters used were of a kind that cannot be taken to pieces for the purpose of being cleaned. In such cases the householder was satisfied with only washing the sponge placed at the top of the filter in the opening through which the water enters the filter.

At some farmhouses situated on the river's banks the water is pumped direct from the Trent to the house through a leaden pipe laid through the bank into the bed of the river. Commonly, however, water is drawn by hand in buckets or pails from the banks or from any convenient boat-landing. Water is taken at all states of the tide. Even at high tide the water is said not to be brackish. For convenience water is taken generally in the Gainsborough rural district at high water, especially during spring tides; for when the tide recedes a copious deposit of slimy mud covers the banks and landing stages,

causing them to become slippery and unsafe for water-drawers, who have occasionally been known to get immersed in the river while filling their vessels.

Persons "born and bred" on the Trentside have a very high and exaggerated estimate of the river water. Regarding it as wholesome and harmless, they are deaf to any representations of the possibility of its being specifically contaminated before it reaches them. On the other hand, visitors to the district, or persons newly coming to live in the district, have at first some difficulty in overcoming their aversion to the muddy looking water. Locally the "Trentsiders" regard use of river water as conducive to longevity.

In addition to the river water many of the cottagers and others in these villages have rain water cisterns in which "soft" water is stored. A few of these are made of metal and stand above ground, but the majority are underground, made of brick and cemented inside. At the date of my visit, owing to the prolonged dry weather, most of the underground cisterns were empty. On looking down into some of them I saw places where the cement had cracked, and where percolation from the adjacent soil was taking place. Commonly these cisterns were situated close to the back doors of houses, and in numerous instances they were only a few feet distant from the privy-middens.

This "soft" water, often dark and smelling unpleasantly, is used chiefly for washing: but some people after boiling and filtering it use it for drinking purposes. The cisterns are generally cleaned out once a year in the dry summer weather, when they are often empty or nearly so. Some of the poorer cottagers collect rain water from the downfall pipes in barrels, but the water in these wooden receptacles soon becomes green in colour and smells offensively.

There are also in the riverside villages pump wells attached to some houses or yards. The objectionable position of these wells renders them liable to pollution, and as matter of fact some of them are regarded as polluted, and are not used except for "swilling" the floors. The water in them is hard and but few persons use them for domestic purposes, the general preference being, throughout the riverside villages already named, for Trent water.

To recapitulate, it may be stated, generally, that the majority of the villages in the Gainsborough Rural District are provided with pump wells, the water from which is used for all domestic purposes. One large village, Misterton, mostly uses canal water, as also does part of an adjacent parish, Walkeringham. Finally, eight riverside villages below Gainsborough town make use more or less of water taken from the River Trent.

Sanitary Administration.—The Gainsborough Board of Guardians are the Rural Sanitary Authority, and their administrative staff comprises a medical officer of health, Mr. H. Wright, and an inspector of nuisances, Mr. W. Eyre, who is also surveyor and canal boat inspector. The medical officer of health receives a salary of 50*l.* per annum, no part of which is repaid from County funds.* He possesses an adequate knowledge of the deficiencies of his district; but he receives small encouragement from his Authority to push forward sanitary improvements. The inspector of nuisances receives an inclusive salary of 80*l.* per annum, but is permitted to practise as an architect. His duties are discharged satisfactorily. He does not, however, always receive the

* Since this was written the Sanitary Authority have increased Mr. Wright's salary to 80*l.*, in response to his application for better remuneration.

...rt he is entitled to in his efforts to place the sanitary condition of ...strict on a better footing.

...e Authority have adopted byelaws with regard to the regulation of ...on lodging-houses, the level and width and construction of new ...s, the structure and the ventilation of new buildings, the drainage ...w buildings, and as to construction of waterclosets, privies, ...its, and cesspools in connexion with new buildings, as to slaughter-...es, as to nuisances arising from snow, filth, dust, ashes, and rubbish, ... as to the keeping of animals. All of these were allowed by the ...al Government Board as far back as August 11th, 1877; but prac-...lly the byelaws are not enforced. Regulations have been made ...ler the Dairies, Cowsheds, and Milkshops Order of 1885.

The Infectious Disease (Notification) Act, 1889, has not been ...opted, nor have any powers been sought under the Infectious Disease ...revention) Act, 1890, or under the Public Health Acts Amendment ...t, 1890.

The Rural Sanitary Authority have no permanent accommodation for ...e isolation of acute infectious diseases, but some years ago a hospital ...arquee for patients and a bell-tent for the nurse were purchased for ...he purpose. I understand that they have not been used. From time to ...ime the tents are brought out and aired so as to be available if wanted.

There is no proper means provided for the thorough disinfection of ...clothing, bedding, &c. Fumigation by sulphur, I am informed, is ...practised to disinfect houses after the occurrence of infectious disease in them.

Enteric Fever.

This disease has been present in the Gainsborough Rural District more or less for a number of years; deaths from this cause have been registered in every one of the last 10 years, 1883 to 1892 inclusive, with one exception, viz., 1887. The numbers are not large, it is true, but they show persistence of the disease in the district. Table I. shows the deaths from enteric fever in the Rural Sanitary District of Gainsborough during each of the last 10 years, 1883 to 1892 inclusive.

Table I.

1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.
5	4	5	3	—	3	2	8	3*	5

* One of these was certified from "continued fever."

I learn from medical men practising in the district that in some villages, such, for example, as Scotter, enteric fever was formerly much more frequently met with than of late years; and this change was generally believed to be due to the carrying out of sewerage works in the particular villages referred to. Among local practitioners a general opinion was expressed that while sewerage schemes had benefited certain portions of the district, yet little or no improvement as regards diminution of enteric fever had taken place in the riverside villages. On my arrival in the locality I made an attempt to obtain full details of enteric fever incidence in one and another portion of the whole rural district. But I found that for various reasons there was much difficulty in getting information. Notification of infectious diseases was not in force, and, from one cause or another, cases of fever had not always been

brought under the notice of the medical officer of health. Unfortunately, at the time of my inquiry, Mr. Wright, the medical officer of health, was unavoidably absent from home, and I lost the assistance this gentleman might have given me, though he kindly, Mr. Pheasey, rendered me every help in his power. Finally I obtained, after the expenditure of much time and trouble, particulars of cases from all the medical men living and practising in the different parts of the rural district. I soon found that my inquiries would have to be limited to the last 4½ years. The lists had to be prepared in some instances from memory, and with this result:—Where a practitioner was having groups of cases every year, some of them club patients of whom no record was kept in his ledger or day-book, the lists of actual cases were admittedly incomplete, but others on the other hand the medical men met with sporadic cases only, sometimes not more than one in two years, the facts as to and occurrences remained in their memories, and their list of cases was much more complete. I have considered it right to make this statement, as, further on, I shall have to point out an inequality of incidence of enteric fever in certain localities, the inequalities being for the above reason even more pronounced, as it is believed, than is shown by the figures.

In the following table I have placed the number of cases reported to me by the local medical men as having occurred in their several practices during the last 4½ years. For purposes of comparison I also give the number of cases which came under the notice of the Medical Officer of Health (taken from his annual reports) for the same period. A consideration of the two sets of figures will show that the Sanitary Authority were imperfectly informed as to the amount of preventable illness occurring in the district under their care, and that consequently their officials, no matter how active or willing, could not take the necessary steps to check the further spread of the infection. The insufficiency of information might have been obviated more recently had the Rural Sanitary Authority adopted the Infectious Disease (Notification) Act of 1889.

Table II.—Showing the Number of Enteric Fever Cases reported during the inquiry as having occurred in Gainsborough Rural Sanitary District during the 4½ years ended June 30th, 1893; and showing also the Total Number of such Cases that came under the notice of the Medical Officer of Health during the same period. (Population 1891, 18,756.)

——	1889.	1890.	1891.	1892.	First Half, 1893.	Total.
Cases of enteric fever heard of during the inquiry.	35	52	40	47	18	192
Cases which had come under the notice of Mr. Wright, Medical Officer of Health.	12	11	3	10	—	36

As has been stated, this list of cases is not to be taken as representing the full extent of enteric fever occurrence in the Gainsborough Rural District, the lists having been compiled in some instances from memory, but for the reasons above noted it will serve, when examined and analysed, to indicate the different incidence in one and another locality within the district. For this purpose I have placed in Table III. the

whole of the parishes in the rural district, with their populations and the number of cases noted as having occurred in each of them during the last 4½ years.

In addition to the above cases, it was stated to me by a practitioner having a large practice, part of which was in riverside villages, that he frequently met with attacks in these villages, having as leading features diarrhœa attended with some fever, but only lasting 10 days or even less. These cases he regarded as due to the same poison as enteric fever, but as very mild or abortive cases.

TABLE III.—Showing incidence of Cases of ENTERIC FEVER during the last 4½ years (to June 30th, 1893) in each of the several Parishes in the Rural Sanitary District of Gainsborough.

Parish or Village.	Population (1891).	1889.	1890.	1891.	1892.	First Half, 1893.	Total.	Remarks.	—
Thonock	96	—			—	—	—	—	
Bole	177	—			—	—	—	—	
Blyton and Wharton	747	—			—	—	—	—	
Beckingham	492	2			2	—	4	—	
Brampton	94	—			—	—	—	—	
Blyborough	213	1			—	—	1	—	
Burton Gate	118	—			—	—	—	—	
Burton, West	52	—			—	—	—	—	
Corringham	704	—			—	—	—	—	
Coates	54	—			—	—	—	—	
Fenton	238	—			1	—	1	—	
Fillingham	283	—			—	—	—	—	
Glentworth	316	—			—	—	—	—	
Grayingham	158	—	—	1	—	—	1	Imported case.	
Greenhill and Redhill	27				—	—	—	—	
Heapham	132				—	—	—	—	
Hardwick	78				—	—	—	—	
Hemswell	338				—	—	—	—	
Haxey	1,855	3			1	1	8	One imported case; and five cases in two houses.	These 38 villages are supplied with water from local wells.
Kexby	314	—		—	—	—	—	—	
Kettlethorpe	196	—		—	—	—	—	—	
Lea	188	—		—	—	—	—	—	
Laughton	300	—		—	—	—	—	—	
Marton	376	—		—	—	—	—	—	
Newton*	307	—		—	2	—	2	Both in one house.	
Northorpe	196	—		—	—	—	—	—	
Pilham	60	—	—	—	—	—	—	—	
Scotter (not including Susworth).	928	3	1	—	—	—	4	One imported	

* The village of Newton, generally called Newton-on-Trent, is a quarter of a mile or more from the river, and is not therefore here classed as a riverside village.

brought under the notice of the medical officer of health. Unfortunately, at the date of my inquiry, Mr. Wright, the medical officer of health, was unavoidably absent from home, and I lost the assistance this gentleman might have given me, though his deputy, Mr. Passmore, rendered me every help in his power. Finally I obtained, after the expenditure of much time and trouble, particulars of cases from all the medical men living and practising in the different parts of the rural district. I soon found that my inquiries would have to be limited to the last 4½ years. The lists had to be prepared in some instances from memory, and with this result:—Where a practitioner was having groups of cases every year, some of them club patients of whom no record was kept in the ledger or day-book, the lists of actual cases were admittedly incomplete; but where on the other hand the medical men met with sporadic cases only, sometimes not more than one in two years, the facts as to each occurrence remained in their memories, and their list of cases was much more complete. I have considered it right to make this statement, as, further on, I shall have to point out an inequality of incidence of enteric fever in certain localities, the inequalities being for the above reason even more pronounced, so it is believed, than is shown by the figures.

In the following table I have placed the number of cases reported to me by the local medical men as having occurred in their several practices during the last 4½ years. For purposes of comparison I also give the number of cases which came under the notice of the Medical Officer of Health (taken from his annual reports) for the same period. A consideration of the two sets of figures will show that the Sanitary Authority were imperfectly informed as to the amount of preventable illness occurring in the district under their care, and that consequently their officials, no matter how active or willing, could not take the necessary steps to check the further spread of the infection. The insufficiency of information might have been obviated more recently had the Rural Sanitary Authority adopted the Infectious Disease (Notification) Act of 1889.

Table II.—Showing the Number of Enteric Fever *Cases reported* during the inquiry as having occurred in *Gainsborough Rural* Sanitary District during the 4½ years ended *June 30th*, 1893; and showing also the Total Number of such Cases that came under the notice of the Medical Officer of Health during the same period. (Population 1891, 18,756.)

——	1889.	1890.	1891.	1892.	First Half, 1893.	Total.
Cases of enteric fever heard of during the inquiry.	35	52	40	47	18	192
Cases which had come under the notice of Mr. Wright, Medical Officer of Health.	12	11	3	10	—	36

As has been stated, this list of cases is not to be taken as representing the full extent of enteric fever occurrence in the Gainsborough Rural District, the lists having been compiled in some instances from memory, but for the reasons above noted it will serve, when examined and analysed, to indicate the different incidence in one and another locality within the district. For this purpose I have placed in Table III. the

Parish or Village.	Population (1891.)	1889.	1890.	1891.	1892.	First Half, 1893.	Total.	Remarks.	—
Scotton	219	—	—	—	—	—	—	—	
Southorpe	44	—	—	—	—	—	—	—	
Stowe	289	—	—	—	—	—	—	—	
Springthorpe	176	—	—	—	—	—	—	—	
Sturton and Branshy	572	—	—	—	—	—	—	—	
Upton	199	—	—	—	1	—	1	Imported case.	
Willingham	406	—	—	—	—	—	—	—	
Willoughton	457	—	—	—	—	—	—	—	
Saundly	126	—	—	—	—	—	—	—	
Harpswell	129	—	—	—	—	—	—	—	
Torksey	195	—	—	—	1	1	2	Both cases in house-boats on the Trent.	These three villages are on the Trentside, and are supplied with water from local wells.
Knaith	86	—	—	—	—	—	—	—	
Morton	1,137	—	—	1	—	—	1	"Continued fever" probably imported.	
Walkerith	85	—	—	—	—	1	1	—	These eight riverside villages are situated on the Trentside below Gainsboro'. Their water supply is more or less taken in all of them from the river.
East Stockwith	302	3	1	2	1	1	8	—	
West Stockwith	723	8	12	15	9	3	47	—	
Wildsworth	118	—	—	—	1	—	1	—	
East Ferry	133	—	—	1	9	—	10	—	
Owston Ferry	1,276	4	23	1	3	1	32	—	
Susworth	150	—	—	1	1	2	4	—	
West Butterwick	653	—	1	2	6	4	13	—	
Misterton	1,411	6	10	13	7	3	39	—	Water *supply partly from canal and partly from wells.*
Walkeringham	752	5	4	—	2	1	12	—	
	18,756	35	52	40	47	18	192		

Owing to the difficulty met with in obtaining full and accurate details as to definite dates of attack, &c., it has been found necessary to limit my remarks to general observations on the incidence of enteric fever on different portions of the district, without special reference to outbreaks in one or another locality.

The 51 villages or parishes* in Table III. are roughly divisible into four groups:—1. Villages, to the number of 38, whose water supply is from local wells, and which are not near to the river. 2. Villages numbering three, which, though situated on the river banks, do not use the Trent water, but have pump wells. 3. The Trentside villages, numbering eight, whose main supply is from the river. 4. Two villages, one of which and a portion of the other, derive their water supply from the Chesterfield Canal.

1. The incidence of enteric fever on the first of these groups of villages is shown in Table IV.

* Although the number of parishes is given as 50 on page 111, the sub-division of Scotter into two parts (Scotter and Susworth) has been found necessary. Susworth, population about 150, is in the parish of Scotter, but is three miles distant from that place, and is practically a distinct Trentside village.

Two, at least, out of a total of three cases recorded in 4½ years, occurred under circumstances completely different to those of the rest of the population. Both cases were male adults living on boats, and both admitted their habitual use of unboiled Trent water for drinking purposes. It is of interest to mention that during the course of the illness in each case, and in accordance with habitual practice, the bowel discharges were thrown overboard into the river.

3. The third group comprises eight villages, situated on the banks of the Trent below Gainsborough, the inhabitants of which are in the habit of using water for domestic purposes. These villages stand on either side of the river a few miles distant from each other, and the most distant of them is not more than 12 miles from Gainsborough. The following table shows the extent to which these eight villages have suffered from fever:—

TABLE VI.—Showing the Incidence of ENTERIC FEVER during the last 4½ years ended June 30th, 1893, on Eight Trentside Villages which obtain their Water Supply from the River.

—	Population (1891).	1889.	1890.	1891.	1892.	First Half, 1893.	Total, 4½ Years.
Cases of enteric fever in eight villages on the Trentside, obtaining water supply from the river.	3,530	15	37	22	30	12	116
Rates of attack per 1,000 living.	—	4·2	10·4	6·2	8·4	3·3	7·30

No information was forthcoming as to whether any of the cases referred to had been imported ones.

4. The amount of recorded enteric fever occurring in the *fourth group*, viz., two villages supplied more or less with water from *the Chesterfield* Canal, is shown in the subjoined table:—

TABLE VII.—Showing the Incidence of ENTERIC FEVER during the last 4½ years ended June 30th, 1893, on Two Villages getting their Drinking Water more or less from the Chesterfield Canal.

—	Population (1891).	1889.	1890.	1891.	1892.	First Half, 1893.	Total, 4½ Years.
Cases of enteric fever in two villages obtaining canal water as part of their supply.	2,163	11	14	13	9	4	51
Rates of attack per 1,000 living.	—	5.0	6·4	6·0	4·1	1·8	5·24

The two villages in the fourth group are Misterton and Walkeringham. Walkeringham lies about a mile from and west of the Trent; a few of its houses [illegible] there abut upon the river, and the people in them use

Though these numbers are small they suffice to indicate the possibility that the water of the Chesterfield Canal receives specific pollution at times from this source, as well as by means of nightsoil brought from other directions, viz., from Gainsborough and Lincoln, where also enteric fever is known to occur from time to time. On the occurrence of enteric fever in these two places I have already remarked, when speaking of pollution of the River Trent, on the banks of which nightsoil manure is also unloaded.

Summarising now the facts as to fever attacks in each of the four groups of villages in Gainsborough Rural Sanitary District, a far greater incidence is found on the populations using the Trent and the canal water than on the populations using other supplies. This is shown in Table IX.

TABLE IX.—Showing the Rates of ENTERIC FEVER Attack per 1,000 living, in each of the Four Groups of Villages in the Gainsborough Rural Sanitary District, during the last 4½ years.

—	Population (1891).	1889.	1890.	1891.	1892.	First half, 1893.	Totals.	Average Annual Rate.
I. 38 villages with pump wells away from the Trent.	11,645	0·7	0·08	0·3	0·6	0·08	1·90	0·4
II. 3 riverside villages using wells.	1,418	0·0	0·0	0·7	0·7	0·7	2·13	0·47
III. 8 riverside villages using Trent water.	3,530	4·2	10·4	6·2	8·4	3·3	32·86	7·30
IV. 2 villages partly using canal water.	2,163	5·0	6·4	6·0	4·1	1·8	23·11	5·24

This is further illustrated by reducing the four groups *to two, viz.*, those on the one hand using well water, and those *on the other hand* using river or canal water.

TABLE X.—Showing Rates of ENTERIC FEVER Attack per 1,000 Inhabitants living in Two Groups of Villages in the Gainsborough Rural Sanitary District during the last 4½ years, classed according to their Water Supplies.

—	Population (1891).	1889.	1890.	1891.	1892.	First half, 1893.	Totals.
41 villages using well water	13,063	0·6	0·0	0·3	0.6	0·1	1·93
10 villages, using mainly water from the Trent or from the Chesterfield Canal.	5,693	4·5	8·9	6·1	6·8	2·8	29·3

In short, of the total 192 cases contributed to the list on page 111 by the medical men living and practising in the Gainsborough Rural District, no fewer than 167, or 86·9 per cent., occurred among a popula-

tion under 6,000 living in villages the main water supply of which was drawn from admittedly polluted sources, viz., the River Trent, or the Chesterfield Canal; whereas only 25 cases, or 13·0 per cent. of the whole, were heard of in an aggregate population of a trifle over 13,000 living in 41 villages using water from local pump wells.

In my General Report on the circumstances of the River Trent in Lincolnshire and part of Nottinghamshire, I have already given a detailed account of ways in which the water in the river can become specifically polluted. As regards, therefore, the villages situated on the Trent below Gainsborough, and drawing their water supply mainly from the river, these are evidently in a position of considerable danger, especially in the event of cholera being imported into this country and being carried to any of the inland towns or districts draining into the Trent. This serious danger, as well as the danger already pointed out in this report as to enteric fever (which is spread much in the same way as cholera), should stimulate the Rural Sanitary Authority to take steps to secure a safe and wholesome water supply for these riverside villages, and to this end skilled assistance should be called in without delay.

Various proposals have been made locally, viz., to (1) pump the river water at each village into settling tanks, and then pass it through filter beds constructed of sand and gravel; (2) to take water from the River Idle above its tidal portion and to pipe it from a reservoir to each village (but as to this proposal it must be remembered that the sewers of Retford discharge into the Idle above the point at which water would be taken, and that the river drains a large tract of heavily manured land); (3) to sink one or more deep bore wells for each village or group of villages.

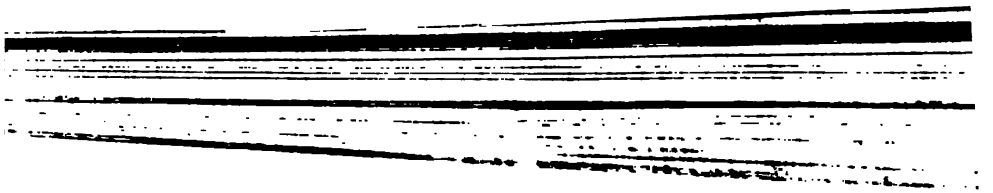
Whatever steps are taken by the Rural Sanitary Authority of Gainsborough to secure for these villages a pure water supply, endeavours should be made to educate and lead public opinion in this matter. The deeply rooted but misplaced confidence which the Trentside people have in their present supply from the river is not easily shaken, while the prospect of the expenditure of any money at all at once raises opposition to any suggested schemes for the improvement of the water supply. Notwithstanding these and other hindrances, the duty of providing the district with pure supplies of drinking water is urgent, and it should no longer be evaded by the Rural Sanitary Authority of Gainsborough. In the meantime the best means of ensuring the safety of the riverside populations and of those drinking polluted canal water is to boil all water used for drinking purposes, as already recommended by the Medical Officer of Health.

There will be found appended copies of the resolutions passed by the parochial committees at the local meetings in riverside villages in 1892, on the subject of water supplies.

Two maps (Nos. 2 and 3) showing the course of the Trent through the Gainsborough Rural Sanitary District are also attached.

July 31, 1893.

P.S.—Since the above report was written a fatal case of cholera has occurred at Morton. The history of the case suggested importation of infection from Hull, where one of the members of the family had recently been visiting. Death took place 19 hours from the onset of the symptoms. The nature of the malady was at once recognised by the medical attendant, Mr. Passmore. Mr. Wright, M.O.H., who also saw the case concurred. A post-mortem examination was made, and a portion of intestine sent to Dr. Klein, who after cultivation experiments



App. A. No. 9.

On the River Trent in Lincs., and Notts, with reference to Water Supply and Enteric Fever; by Dr. Bruce Low.

On Recent Prevalence of Enteric Fever in the Borough of Newark-on-Trent.

The population of the borough in 1891 amounted to 14,457, and th inhabited houses numbered 3,202. The chief industries of the plac are malting and brewing.

Newark stands on alluvium and gravel, overlying the New Re Sandstone. The houses in the old parts of the town are crowde closely together in narrow streets and in courts or yards which ope out of them. Dwellings in the more modern parts of Newark hav ample garden space. There are several rows of artisan cottages whic have doors and windows only on one side.

Since the inspection of the borough in 1885 by Dr. Parsons, considerable improvement in its sanitary condition has been effected. The direction and extent of these improvements will be gathered under the following headings :—

Sewerage.—During the last 14 years the old brick sewers have been improved, and in some cases replaced or extended by glazed and socketed pipe sewers, ventilated with grids in the roadway and in some instances by vertical shafts carried up the gables of adjoining houses. Flushing chambers, holding 800 to 1,000 gallons of waters, have been constructed at the head of most sewers. These flushing chambers are filled by a hose, and are discharged once a week. The sewers, besides receiving the rainfall, have periodically discharged into them large volumes of water from breweries and malt-houses. The sewers discharge into that branch of the Trent on the banks of which the town stands by seven separate "drowned" outfalls. The sludge accumulating in the river near the outfalls is dredged out at intervals.

House Drainage.—In the newer parts of the town, house drains are properly constructed and sinks are disconnected. In the older parts the house drains are often imperfect, or badly laid. Occasionally slops are conveyed along open channels with faulty gradients. The drain inlets are usually out of doors. Yard gulleys are sometimes imperfectly trapped, a favourite pattern being a shallow metal trap which is easily broken.

Excrement and Refuse Disposal.—There are some 1,250 water-closets in Newark and about 1,400 tub-closets. Midden privies are now almost banished from the town. The tub-closets are emptied weekly by a contractor. The tubs after being emptied are dusted with some disinfecting powder and replaced. House refuse is also removed once a week. In connexion with cottage property there are movable receptacles provided for refuse. In other cases there are ashpits, which are usually covered and not excavated below the level of the ground. The refuse and privy contents are carted away to a "tip" or depôt outside the town and sold to farmers as manure. At the Mount Church Schools the objectionable vault privy system is still retained. Each of the vaults in this instance measures about 15 feet long, and is sunk about 2½ to 3 feet below the level of the ground. The scavenging of the streets and market is done by the corporation's own men, the refuse being led to the contractor's depôt.

Water Supply.—Formerly Newark derived its supply from local wells of no great depth. In 1853 a company was formed to supply water to the town from culverts and wells made in the gravel close to the main channel of the Trent, about a mile from Newark. The culverts were merely tunnels constructed of brick with open joints through which the water percolated from the gravel underlying the surface. The first culvert was 340 yards in length and parallel to the Trent. In addition, three wells of different depths, varying from 12 to 36 feet, have been sunk at different dates and connected with the

/ater being pumped from the wells direct into the mains eservoir 2 miles away on Beacon Hill. On Sundays stopped, the supply is delivered by gravitation from the til a few years ago, whenever the Trent was flooded is, the water overflowed the river's banks at the water- hed the vicinity of the wells, causing, it is said, the town) become for a time muddy. To obviate this an embank-) to prevent the floods from the Trent overflowing the The most recently sunk well at the waterworks, which is eet deep, was constructed by the late water company at out 7 yards from the Trent. From this well a pipe was ur years ago," to the river, so that whenever the water was low, Trent water could be admitted to the well and) other water direct to the town.

asons the maltsters and brewers require large quantities eir trade purposes, especially in October and November. again, when there is much watering of the streets and sewers to be done, larger demands are made upon the vice. Of the total existing inhabited houses in Newark, company's water, while no less than 1,547 (*i.e.*, 46 per hole) use water from local pump wells. These wells, exception, are extremely liable to pollution. Chemical demned many of them, and their surroundings are such nost of the remainder. They vary from 8 to 30 feet in sunk generally in the gravel upon which the town is

r four years ago the Corporation of Newark becoming the water supplied to the town by the water company, ıt to buy up the undertaking. The company, however, with their works, and applied to Parliament for powers r capital and to construct additional culverts to collect orporation successfully opposed this application, and ıle to arrange terms of purchase. The quality and water afforded by the works not being satisfactory, the of Newark very wisely sought skilled assistance to procuring a better supply; and with the help of , they adopted a scheme, at some considerable cost, was obtained from a well 73 feet depth, in the New Red Edingly, 11 miles from Newark, and pumped to a which the town is now supplied by gravitation. The irst received in the town and its use begun on July 20th ear. Copies of chemical analyses of samples of the new the late Dr. Tidy, and of analyses of samples of the old t various dates are attached to this report. A map o attached showing the course of the Trent from Newark.

Enteric Fever.

half of 1884, a considerable outbreak of enteric fever ark, some 95 cases coming under the notice of the then of Health, Dr. Ashby. Of these cases 12 proved fatal.) to have been during the same year an increase in the ıca attacks, no fewer than 22 deaths from this cause stered during the year. It was in consequence of this

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On Recent Prevalence of Enteric Fever in the Borough of Newark-on-Trent.

outbreak that Dr. Parsons received instructions, in 1885, to inspect the sanitary condition of the town. In his report, presented to the Local Government Board in June of that year, Dr. Parsons pointed out a number of unwholesome conditions (including possible derivation of the public water supply in part directly from the Trent), many of which might very possibly have been concerned in the fever prevalence. In his view, "the disease owned different causes in different cases," and he was not able to distinguish among a multitude of possible causes of fever, that which had had most influence in spreading the disease. By improvements effected since Dr. Parsons's visit, Newark is now in a far better sanitary condition than formerly. Nevertheless enteric fever has persisted in showing itself, year by year, in the borough. During each year, since 1874, deaths from enteric fever and from diarrhœa have been registered in the town. I have placed the numbers in the subjoined table.

Table I.—Showing Deaths registered year by year in Newark, from Enteric Fever and from Diarrhœa, from January 1st, 1874, to June 30th, 1893.

Deaths from	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	first half, 1893.
Enteric fever -	13	16	9	5	3	4	2	6	3	3	12	4	3	3	7	3	5	12	12	8
Diarrhœa - -	6	10	11	3	30	7	15	10	8	7	22	6	14	9	3	14	11	2	5	—

On January 1st, 1890, notification of infectious diseases came into force in the Urban Sanitary District of Newark-on-Trent, and *since* then, therefore, more precise information as to the actual amount of non-fatal fever occurring in the town has become available. The number of cases of enteric fever notified year by year in *the borough* since January 1st, 1890, is given in the following table:—

Table II.—Showing the Numbers of Notified Cases of Enteric Fever and Deaths therefrom, in Newark-on-Trent during the last 3½ years from January 1st, 1890, to June 30th, 1893.

Enteric fever.	1890.	1891.	1892.	First Half, 1893.	Total in 3½ Years.
Cases - - - -	53	125	69*	50	297
Deaths - - - -	5	12	12	8	37

* Not including two cases notified as continued fever.

The circumstances of these 297 notified cases were investigated at one time or another by Mr. Wills, the present Medical Officer of Health, and from him I have obtained information of their distribution in each month of the year. Similarly he has supplied me with the figures, so far as they were forthcoming, for the autumn months of 1889. These data I have arranged in the following table:—

These facts tended to confirm Mr. Wills's suspicion that the town water supply was doing much to foster enteric fever in the borough; and having regard to the circumstance that part of this supply was on occasion being taken directly from the Trent, which river was known to be seriously polluted by the sewage of populations above Newark, the medical officer of health lost no time in urging his sanitary authority to seek elsewhere a source of supply that was altogether above suspicion. Upon this advice, the Newark Corporation, acting with commendable courage and promptitude, have carried out a scheme whereby a constant supply of pure water from the New Red Sandstone at Edingly is now being delivered to the town.

It only remains for the Sanitary Authority of Newark-on-Trent, now that they have secured this public supply of pure and wholesome water, to take steps without delay to close all polluted wells in the borough. Most of the wells in the place, as already stated, are, from their proximity to dwellings, and to privies, ashpits, pigsties, and the like, in constant danger of pollution, if indeed they are not already polluted. Hitherto active steps towards closing many of these wells could not be taken, as the Urban Sanitary Authority had not then an alternative supply of pure water to substitute for the polluted one.

August 14th, 1893.

IV.

ON THE WATER SUPPLIES OF THE THORNE RURAL SANITARY DISTRICT.

In consequence of the widespread prevalence of diphtheria and scarlet fever in the Thorne Registration District, Dr. Parsons was, in 1883, directed by the Local Government Board to visit and inspect the Rural Sanitary District. Among other matters he reported unfavourably concerning the water supplies of several places in the district, more especially of the town of Thorne. Since then correspondence has been carried on from time to time between the Local Government Board and the local authority on this subject. In the annual reports of the Medical Officer of Health reference has often been made to the unsatisfactory state of the water supply of Thorne, as well as of some other places within the district. More recently the County Council of the West Riding of Yorkshire had their attention drawn to the Thorne water supply, and their medical officer, Dr. Whitelegge, in October 1891, visited the town and reported upon its condition and on the state of its water supply. A copy of this report was forwarded to the Local Government Board for their information. Hereupon the Rural Sanitary Authority took into special consideration the question of the town's supply, and as a result instructed Messrs. Fairbank, C.E. (of Westminster and Driffield), to report on the present water supply, and to prepare a scheme for its improvement. The report of these engineers, dated June 16th, 1892, condemned the present supply, and submitted estimates for the supply of the town from a deep bore well. Upon the issue of this report a parish meeting at Thorne passed a resolution appointing a committee to confer with representatives of the Rural Sanitary Authority "on the best mode of "supplying the town with pure water." This joint committee of

On the River Trent in Lincoln and Notts, with reference to Water Supply and Enteric Fever; by Dr. Bruce Low.

On Recent Problems of Water Supply in the Borough of Newark-on-Trent.

Results of Analyses of Samples of Water by Dr. Tidy for Borough of Newark.

(The results are stated in Grains per Imperial Gallon of 70,000 Grains, the Organic Carbon and Nitrogen in parts per 100,000.)

Description.	Total Solid Matter.	Ammonia.	Nitrogen, Nitrates, and Nitrites. = Nitric Acid.	Oxygen required to Oxydise Organic Matter.	Organic Carbon.	Organic Nitrogen.	Lime CaO.	Magnesia MgO.	Sulphuric Anhydride SO_3.	Chlorine = Common Salt.	Hardness.		
											Before Boiling.	After Boiling.	
New Well Water:—	Grs.	Grs.	Grs. Grs.	Grs.	Parts per 100,000.		Grs.	Grs.	Grs.	Grs. Grs.	Degrees.	Degrees.	
1. Water at 20 ft. New supply from	12·60	0·003	0·728=3·276	0	0·046	0·016	2·46	1·729	1·20	1·224=2·006	9·21	4·9	Taken 25th Oct. 1890. Each contained Silica 0·40 grs. Very slightly alkaline. Produced no odour on boiling. No poisonous metals.
2. „ 68 ft. New Red	12·40	0·003	0·728=3·276	0	0·034	0·012	2·46	1·765	1·20	1·224=2·006	9·00	4·9	
3. „ 100 ft. Sandstone.	11·60	0·004	0·749=3·371	0	0·022	0·012	2·24	1·657	1·27	1·224=2·006	9·51	4·5	
Present Waterworks Supply:—													
1. Sample, Feb. 1890 -	40·45	0·001	0·066=0·297	0·038	0·070	0·025	14·83	2·436	18·80	1·491=2·48	29·37	20·63	Silica 0·50 grs.
2. „ Dec. 1889 -	47·20	0·003	0·135=0·607	0·037	0·121	0·031	8·06	6·73	15·47	2·090=3·42	26·40	18·20	„ 0·60 „
3. „ Oct. 1890 -	41·60	0·004	0·135=0·607	0·045	0·108	0·045	11·20	2·45	12·20	3·528=5·782	25·23	14·84	„ 0·40 „ Clear. Total solid residue of a brownish colour.
4. „ „ -	40·40	0·008	0·073=0·328	0·041	0·105	0·040	16·86	2·594	12·27	3·528=5·782	24·80	14·00	Silica 0·40 grs. Turbid. Total solid residue of a brownish colour.

Dr. Tidy in his letter accompanying the analyses of the new supply for Newark (analyses 1, 2, and 3) says:—

"It is a most excellent water for a town supply. I have spoken of it as an 'ideal' water; the phrase was scarcely too strong. The water is absolutely free from oxidisable or organic matter; contains about 12 grs. of solid matter per gallon in solution, and has an initial hardness of between 9 and 10 degrees.

"I have also given you analyses of the water at present supplied to Newark. The samples contained varying quantities of total solid matter ranging from 40 to nearly 50 grs. per gallon, and having a hardness varying from 24 to 29 degrees. Considering the enormous importance of a pure water supply on the health of a community, the Authority would, in my opinion, be committing a grievous wrong if they failed to supply the very best water practically procurable. Compare the results of the analyses and there can be no shadow of a doubt as to what should be done. * * * *

" H. Mervyn Tidy."

parish representatives and members of the Rural Sanitary Auth
next issued a report, dated November 1892, in which the old w
supply of Thorne was defended, and contention made that the old su
could not be injurious to health for the reason that many perso
Thorne lived to a great age. On the question of expense and on
grounds the joint committee opposed Messrs. Fairbank's scheme,
recommended instead that the old public supply should be improve
filtration through polarite. Samples of the water, after it had
passed through polarite, were meanwhile sent by the committee to
public analysts for examination; but the reports of these analysts
proving satisfactory, the whole question remained in abeyance till
of the present year, when the annual report for 1892 of the Me
Officer of Health was received by the Local Government Board.
this report reference was again made to the fact that nothing fa
had been done to improve the Thorne water supply, and attention
again drawn to the unsatisfactory condition of the water suppli
several other places in the district. The Local Government B
after consideration of this report, decided that the whole circumsta
of the different sources of water supply in the Thorne Rural San
District should be investigated by the Medical Department, and
was conducting a similar inquiry in the adjoining Rural San
District of Gainsborough, I was instructed to undertake the inv
gation of the facts concerning the water supplies of the Thorne R
District also.

Topography.

The Rural Sanitary District of Thorne is situated partly in the W
Riding of Yorkshire and partly in North Lincolnshire. It compr
the whole of the Union of Thorne, except the Urban Sanitary Dist
of Crowle, which, in turn, includes part of the village of Eastoft.
River Trent forms the eastern boundary of the Thorne Rural Sanit
District for a distance of some 6 or 7 miles. On the west is the Ru
Sanitary District of Doncaster, and to the north and south are respe
tively the Rural Sanitary Districts of Goole and Gainsborough. T
total area of the Thorne Rural District is 61,379 acres, of which 28,4
acres are in Yorkshire and the remainder in Lincolnshire. At the
census the population numbered 11,802, living in 2,865 houses.

Geologically, the western portion of the district is on the New
Sandstone; elsewhere it is on the Post-Tertiary beds consisting
Warp, Peat, Sand, Strong Laminated Clay, and Gravel and Sand o
lying the New Red Marl, which rises to the surface in the Isl
Axholme.

There are two towns in the district, viz., Thorne and Epworth;
latter is situated on some rising ground to the south, called the Isl
Axholme, the rest of the district being flat. Through the district
Doncaster and Keadby Canal passes eastwards from the Don to
Trent.

The main industry is agriculture, but on Thorne and Hatfield M
the preparation of Peat Moss litter gives employment to a numbe
persons. Some of the parishes are sparsely populated, compri
outlying farms and small clusters of cottages.

The following table gives the names of the parishes in the Th
Rural Districts with area, population, number of inhabited houses,
rateable value in each instance.

channels are flushed in summer time or in dry weather by a water-cart discharging its contents at the highest point in the town, and as there is a good fall the slops are carried away into ditches at different points. The system is imperfect and antiquated, and as worked at present it is unsatisfactory. Here and there short sections of pipe sewers convey slops to an outfall in a ditch. Some houses in Epworth have no house-drains. A few houses drain to cesspools emptied at irregular intervals.

Excrement and Refuse Disposal.—There are a few waterclosets in Thorne, but the usual method of excrement disposal is by means of midden privies. The middens are often large, deep, and uncovered, consequently they are wet and offensive. Some are close to houses. There are also some old vault privies of an objectionable sort. Occasionally privies are built against the outside walls of inhabited houses, causing dampness of room-walls and unpleasant smells inside the houses. There are a few pail closets, emptied on garden land by the occupiers. At more than one school so-called dry trough closets are in use. Over the excrement is sprinkled ashes, dry earth, or peat moss litter: and the contents are said to be removed at short intervals; but the plan, in my opinion, is far inferior to the ordinary pail closet. These school trough closets were often foul, wet, and generally offensive when I saw *them*, especially on the girls' side (owing perhaps to the fact of their containing more urine).

With regard to removal of refuse occupiers have to make their own arrangements. In Thorne a good deal of difficulty is found in getting farmers to lead away refuse during the summer months. At the suggestion of the nuisance inspector, a small sum is paid by the Sanitary Authority for emptying middens in summer, where the occupant himself is unable to remove the refuse. It is, however, very desirable that the Sanitary Authority should themselves undertake, under section 42 of the Public Health Act, 1875, the removal of privy contents, refuse, &c., in Thorne and Epworth; in the latter place, especially, I saw numerous cases where the middens and privies were in a neglected state, crammed to overflowing with filth and house refuse.

Slaughter-houses are registered. Their condition at *the date of my* visit was satisfactory. They are regularly inspected.

Common Lodging-houses.—There are only two in the district, one at Thorne, and one at Epworth. I found both clean and apparently well looked after.

Sanitary Administration.

The Sanitary Authority have adopted byelaws in respect of cleansing footways and pavements; for the removal of house refuse, the cleansing of earth closets, privies, ashpits, and cesspools; for regulating slaughter-houses; and for regulating common lodging-houses. These were allowed by the Local Government Board in 1883, as were also byelaws with respect to nuisances.

No regulations under the Cowsheds, Dairies, and Milkshops' Order of 1885 have been adopted by the Sanitary Authority. In June 1891, the Infectious Disease (Notification) Act, 1889, was adopted in the district. On the same date the Rural Authority adopted sections 4, 5, 7, 8, 9, 10, 11, 13, 14, 16, 17, and 18 of the Infectious Disease (Prevention) Act, 1890, and also all of Part III. of the Public Health Acts Amendment Act, 1890, applicable to rural districts.

Means for the isolation of early cases of infectious diseases have been provided for during the last few years by renting a block of three cottages in the parish of Belton. A caretaker and his wife reside on

the premises, and the latter is retained to act as nurse if required. Only two cases (both of small-pox) have been treated in these cottages since they were secured.

There is no proper apparatus for disinfecting clothing, bedding, &c. Fumigation by sulphur is occasionally practised, and disinfectants are supplied gratuitously to those considered unable to purchase them.

The Medical Officer of Health is Dr. H. W. Arbuckle (D.P.H. Camb.). He has a salary of 70*l.* per annum, part of which is repaid out of County funds. He makes systematic inspections of his district, and gives good advice to his Sanitary Authority, who, however, do not always act upon it. He is an able and energetic officer.

The Inspector of Nuisances is Mr. Stanley. He acts also as Surveyor and has a salary of 75*l.* per annum, part of which is repaid from County funds. He is also Canal Boat Inspector for which he receives a further sum of 10*l.* per annum. He is well acquainted with the sanitary defects of his district, and is a zealous and intelligent officer. Owing to the remoteness from Thorne, where he resides, of some of the outlying places in the district, and owing also to the fact that there is no railway service near these places, Mr. Stanley, who has to traverse the distance by walking, is unable to visit the outlying portions of his district so frequently as he should do. His salary scarcely enables him to keep a horse, without which regular inspection of such places as Wroot, Epworth, Belton, and Sykehouse cannot be easily made

The Water Supplies.

Thorne.—(Population in 1891, 3,556.) Three-fourths of the population of the town of Thorne drink canal water, boiled or unboiled. The majority of houses have shallow wells attached to them, but the water in these is hard, and is a large proportion of cases polluted. This pollution is not to be wondered at considering the relation of many of the wells to privies, middens, and pigsties. The houses in Thorne situated to the south-west of the canal have wells the water in which is yellow (from peat), and is not for various reasons used for drinking. The water supply of Thorne is now, however, mainly derived from the canal, which skirts the whole length of the town. There are three intakes, namely: (1) near the workhouse, at the north-west end of Thorne; (2) near the middle part of the town; and (3) at the south-east end of it. Connected with each of the intakes is a rough filter bed. The filter bed at the middle intake I caused to be opened for inspection. It may be described as a covered chamber about 14 feet long and about 3 feet wide with a depth of about 5 feet. This chamber is divided into four compartments of nearly equal size which communicate with each other by means of openings in the dividing walls, and through which the water passes in succession. The compartments are: (*a*) a so-called settling tank into which the water from the canal is received; (*b*) a first filter bed filled to a depth of 3 feet with broken coke and coarse gravel; (*c*) a second filter provided with similar materials; and (*d*) the receiving tank from which the water flows by gravitation through pipes to the pumps in the town. The canal is on a higher level than most of the town. The filtering beds are cleaned out, I am informed, once in three months, when some inches of black sludge are usually removed from the settling tank. After washing, the filtering materials are replaced, but on two occasions in each year the coke and gravel are renewed. Previous to the year 1856 Thorne people drew their water in buckets direct from the canal, but in that year the

Hatfield.—(Population in 1891, 1,686.) The water supp parish is from shallow wells, which are often situated in proximity to privies and other collections of filth. For instan one well, 16 feet deep, showing signs of percolation on its inside only 9 feet from a double privy midden. The water in this w told, became thick and muddy after heavy rains. Another saw was only 15 feet distant from three privy middens and 9 a wet pigstye.

Some wells are only covered by a wooden lid, which is of broken and dilapidated. Water is got occasionally from such letting down a bucket by a rope, each drawer bringing his or her of rope. Complaints are sometimes made, where a well supplies of houses, that people are not always careful in bringing a clea bucket, and that from the use of dirty vessels the water in the this way polluted. The use of such wells is also attended by children or to aged persons letting down the bucket, for in s there have been narrow escapes of the feeble water-drawer fr pulled by the weight of the filled bucket into the well. In one for example, her neighbours expressed to me fears that an ol aged 80, would be dragged into the well in this way, or wou while lifting the lid. The average depth of the Hatfield wel 12 to 18 feet.

Stainforth.—(Population in 1891, 644.) The village of S derives its supply partly from the canal and partly from shallow average depth of which is about 16 feet. Inmates of some houses on the towing-path of the canal, not only drink the canal water, throw their slops direct into the canal. I saw boats at th pumping out into the canal bilge water which had been accu in them during their trip. Wells here are liable to polluti soakage from deep privy pits and middens. For example, a we was admitted to become discoloured after heavy rains had radius of 8 feet from it three privies with middens.

With regard to the canal some residents on its banks at St informed me that the water in long-continued dry *weather* " They said it is always "bad" in dry seasons, such as the present and early summer have been. Stainforth is distant from Thorn about 3½ miles.

Fishlake.—(Population 1891, 450.) Here the water supply shallow wells, from rain water stored in cisterns, or from th Don. The surface wells are already polluted or in imminent d pollution. Some are admittedly so contaminated that they are or for swilling yards. The water, I was told, was "too nasty" to in the house. Those who store rain-water use it for drinking so long as it lasts, but when it is exhausted they take water f Don River, as habitually do other persons who have no so cisterns.

The Don, in its modern channel, locally known as the Dutc falls into the Ouse at Goole, about ten miles below Fishlake. T is tidal at Fishlake, and water is, therefore, drawn from it onl tide. The pollution of the Don has already been spoken o referring to the canal. About two miles above Fishlake th Don is connected with the canal by a lock at Stainforth, an come up the river from Hull, and *vice versâ*. The channel river, I am told, is becoming somewhat narrower from si the amount of navigation is less than it was 20 years ago. At c steamers plied between Stainforth, Thorne, and Hull. The w

Hatfield.—(Population in 1891, 1,686.) The water supply of th parish is from shallow wells, which are often situated in dangerc proximity to privies and other collections of filth. For instance, I not one well, 16 feet deep, showing signs of percolation on its inside, situat only 9 feet from a double privy midden. The water in this well, I w told, became thick and muddy after heavy rains. Another well that saw was only 15 feet distant from three privy middens and 9 feet fr a wet pigstye.

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Stainforth.—(Population in 1891, 644.) The village of Stainfor derives its supply partly from the canal and partly from shallow wells, th average depth of which is about 16 feet. Inmates of some houses abuttin on the towing-path of the canal, not only drink the canal water, but als throw their slops direct into the canal. I saw boats at this plac pumping out into the canal bilge water which had been accumulatin in them during their trip. Wells here are liable to pollution fro soakage from deep privy pits and middens. For example, a well whic was admitted to become discoloured after heavy rains had within radius of 8 feet from it three privies with middens.

With regard to the canal some residents on its banks at *Stainforth* informed me that the water in long-continued dry weather "*stank.*" They said it is always "bad" in dry seasons, such as the present spring and early summer have been. Stainforth is distant from Thorne only about 3½ miles.

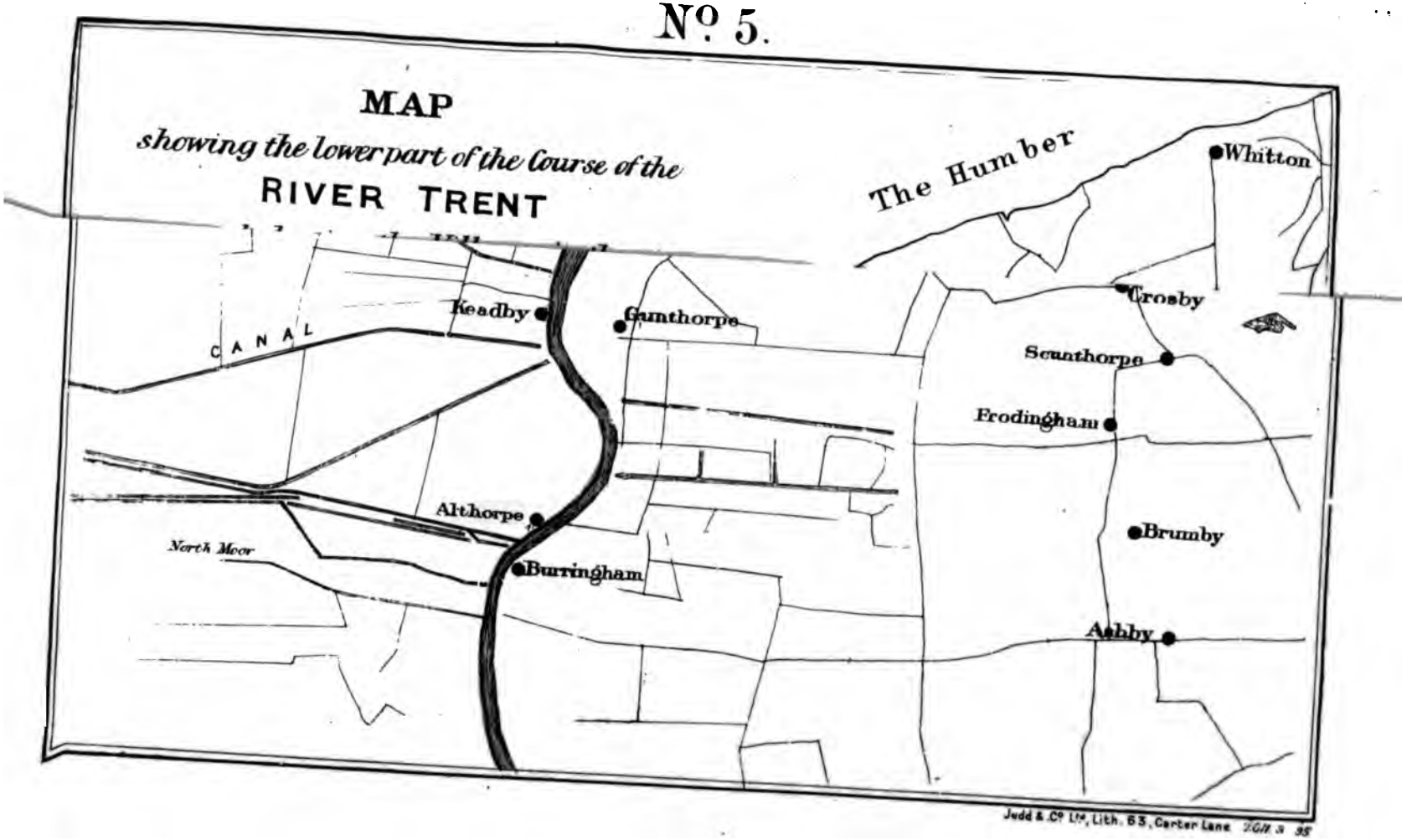
Fishlake.—(Population 1891, 450.) Here the water supply is fro shallow wells, from rain water stored in cisterns, or from the Rive Don. The surface wells are already polluted or in imminent danger o pollution. Some are admittedly so contaminated that they are only use for swilling yards. The water, I was told, was "too nasty" to be use in the house. Those who store rain-water use it for drinking purpose so long as it lasts, but when it is exhausted they take water from th Don River, as habitually do other persons who have no soft-wate cisterns.

The Don, in its modern channel, locally known as the Dutch Rive falls into the Ouse at Goole, about ten miles below Fishlake. The rive is tidal at Fishlake, and water is, therefore, drawn from it only at lo tide. The pollution of the Don has already been spoken of whe referring to the canal. About two miles above Fishlake the Rive Don is connected with the canal by a lock at Stainforth, and boat come up the river from Hull, and *vice versâ*. The channel of th river, I am told, is becoming somewhat narrower from silt, an the amount of navigation is less than it was 20 years ago. At one tim steamers plied between Stainforth, Thorne, and Hull. The water i

If it be contended that no great mortality attributable to the u impure water has arisen in the district in recent years, the answ that the water supply has every facility for becoming specifically taminated by the bowel discharges of infected persons, and that fore disaster may occur at any time on a scale of considerable magn Belief in the security of Thorne from epidemics of enteric choleraic diarrhœa, or cholera, does not rest indeed upon any basis. Having regard to the frequent daily communication Thorne has with Hull by means of the Trent, the canal, and by is obvious that if cholera were introduced from abroad into the Hu ports, the disease has plenty of chances of quickly reaching the T district and spreading itself there. Apart from this danger, th the ever-present one of enteric fever being introduced to the from Sheffield or elsewhere, either by reason of the nightsoil or by persons who live on board boats and whose discharges infect hundreds unconsciously drinking the specifically contam water.

The map (No. 5) opposite shows the course of the Trent in the T Rural Sanitary District. The position of the parishes throughou whole district can be seen on the large map at the end of the g report on the River Trent.

No. 5.


MAP
showing the lower part of the course of the
RIVER TRENT
The Humber
Whitton
Crosby
Scunthorpe
Frodingham
Brumby
Ashby
Keadby
Gunthorpe
CANAL
Althorpe
North Moor
Burringham
Judd & Co Ltd, Lith. 63, Carter Lane

No. 10.

Report on an outbreak of DIPHTHERIA in the HINCKLEY URBAN AND RURAL SANITARY DISTRICTS; by Dr. S. W. WHEATON.

IT having come to the knowledge of the Local Government Board, through the Quarterly Return of the Registrar General, that an epidemic of diphtheria had broken out in the Hinckley Urban and Rural Sanitary Districts, which had caused 10 deaths during the third quarter of 1893, I was instructed to make an inquiry into the circumstances with which the disease was associated.

I. HINCKLEY URBAN SANITARY DISTRICT.

(*a.*) *General Sanitary Condition of the Hinckley Urban Sanitary District.*

The district under the control of the Hinckley Urban Sanitary Authority comprises the town of Hinckley with a few outlying houses. The district has an area of 3,729 acres, and had in 1891 a population of 9,638 persons living in 2,032 houses. The population has increased rapidly of late years; in 1881 it consisted of 7,693 persons only, living in 1,681 houses. At the present time the population is estimated at 10,000 persons.

The inhabitants are chiefly engaged in the stocking and boot manufactures, and there is a large proportion of young adults of both sexes who go to work in the factories, of which there are many in the town.

The town is situated at the southern extremity of a spur of hills forming part of the watershed between the Rivers Anker and Soar. Nearly the whole of the town is situated at an altitude of more than 400 feet above Ordnance datum, and the greater part of it is built on ground sloping to the south-west, towards the River Anker, which is about four miles distant. The subsoil consists of a stiff clay, in most places of great depth, with occasional beds of sand. The ground, therefore, is cold and retentive of moisture. Owing to its high elevation above the surrounding country, which is almost level, the town is much exposed to bleak winds from all quarters; and it is subject to fogs and mists, which, I am told, frequently accompany winds blowing from the south-west. There are four main streets converging to the centre of the town, which, with the exception of Castle Street, are fairly wide and open; the space between these main streets is filled up by a collection of courts and short streets, and by houses grouped irregularly, so as to impede lighting and ventilation. In the outskirts of the town, however, where a good deal of building has taken place of late years, there are a number of streets the houses of which are well built, and provided with sufficient open space both in front and at the rear.

Water Supply.—This is derived from a deep well situated near the village of Snarston, 14 miles distant. The well is said to communicate with some disused colliery workings. The water is pumped into an iron pipe, which conveys it to the town, where it is collected in two reservoirs, a high level and a low level one, from which it is distributed by gravitation. Nearly all the houses in the town are supplied with this water, which appears to be of excellent quality as well as abundant. A very few households still use wells, and in one instance I found that rain water was being used for drinking purposes.

Isolation Provision.—The Authority has not made any hospi vision for the accommodation of persons suffering from in diseases.

Disinfection.—The Authority possesses no disinfecting app nor is the disinfection and fumigation of infected houses carried the Sanitary Authority.

The Infectious Disease (Notification) Act, 1889, has no adopted.

Sewerage.—The present Inspector of Nuisances, Mr. W. T. who combines this duty with that of Surveyor to the Authority, only been appointed for a few weeks, and being a stranger to th was not able to give me much information with regard to the se of the place. Mr. Howse, however, rendered me every assistan was in his power, and the sewers were opened for my inspec various points in the town. The Authority possesses no reliab of the sewers, and this rendered the investigation more difficult. sewerage of the town was commenced in 1883; but no regula appears to have been followed, and some of the old highway and culverts still remain, and are connected with the sewers whic been more recently constructed. Since it is situated mainly slope of a hill, the town is well placed for sewerage. There ar main sewers, composed of sanitary pipes, which collect the sewag the northern and southern portions of the town, and which j different points, an outfall sewer, by which the sewage is carri to the sewage farm, which is about a mile to the south-west of the The outfall sewer commences in Rugby Road at the south-weste of the town, where it is joined by the northern main sewer, and sewer passing down Coventry Road. The outfall sewer passes the Rugby Road, and at the junction of Rugby Road and New R joined by the southern main sewer, after which it passes straight fields to the sewage farm. The mouth of the outfall sewer is not vided with any flap to prevent the wind from blowing up it. The an arrangement by which, if the level of the sewage in this sewer above a certain height, it overflows directly into the *Sketchley Br* At the time of my visit some of the sewage was *overflowing* in way. At the farm the sewage passes through a trough contai lumps of a preparation of alum, and then into a depositing tank, which it runs into a carrier conveying it on to the farm land, whi about 170 acres in extent, and on which the sewage is distribute "broad irrigation." The land of the sewage farm is partly a partly permanent pasture. The effluent from the sewage farm es into the Sketchley Brook, which joins the River Anker. At the of my visit the effluent was not clear, and contained a large amou flocculent matter in suspension, but it had no offensive odour.

Of the two main sewers, that which collects the sewage fro southern portion of the town commences in Burbage Road, at point it receives the sewage from the workhouse; it then runs a parallel to the railway, passing across several fields, and rece several branch sewers from streets at right angles to its cours finally passes across Station Road and down New Road, at the ju of which with Rugby Road, as just mentioned, it joins the sewer.

From the manhole at the upper end of this southern main sew the Burbage Road a most offensive fœcal odour was emitted at th of my visit, and the sewer at this point was found to contain a amount of liquid filth. At a point about 200 yards further down

privy middens are not emptied at regular intervals; and not until they are overflowing in most instances. The material removed is carried to the sewage farm, from which it is carted away by farmers as they require it.

House Accommodation.—A great number of the houses in the town are old and dilapidated, and in many instances they have brick floors; but on the outskirts of the town there are a large number of houses recently built or in course of erection, which are well built in every way. There are many courts in the town. These latter are as a rule square, with narrow entries; the houses in them are generally very dilapidated, often without eave spouting, and with defective roofs and crumbling walls. There are also a few old thatched cottages still remaining in these courts. The ground around the houses in the courts, and in the older streets of the town, is very uneven, and either unpaved or laid with cobbles; pools of stagnant water lie around the houses, and the presence of overflowing privy middens and defective house drains adds to the general filthiness of the surface of the ground. The yards in the newer houses are in most instances paved with bricks, but often these are unevenly laid. In consequence of the before-named defects and the clayey character of the subsoil, the ground around houses in Hinckley is almost everywhere very damp. This dampness is much increased by the custom of constructing leaky rain-water cisterns below the ground level close to the houses, or in cellars under the houses. These rain-water cisterns often have an overflow pipe communicating with the sewer. The cisterns are composed of bricks, and, even when lined with a thin layer of cement, this is often found to be cracked; so that in some cases the filth from privy middens sunk below the ground level obtains entry into the cistern.

Nuisances Arising from the Keeping of Animals.—In some instances pigs and fowls were found to be kept in proximity to dwellings, and in such manner as to give rise to nuisance. In one instance fowls and rabbits were found established in a cellar adjoining a house in which diphtheria was present. As a rule, however, nuisances arising from the keeping of animals are not common in the town.

Slaughter-houses.—The slaughter-houses in the town are not registered, and do not appear to be supervised in any way; in several instances they were dirty and dilapidated, with defective flooring and without drainage. Accumulations of offal in the neighbourhood of slaughter-houses, in privy middens, or on manure heaps, were noticed in several instances.

Cowsheds and Dairies and Milk Shops.—With regard to these there is no register kept, and there does not appear to be any supervision of them by the Sanitary Authority. I only observed one cowshed in the town, the condition of which was very filthy; but there are a number of milk shops at which milk, brought in from the surrounding country, is sold. In several of these milk shops the milk was kept in living rooms, in others in cellars under the houses, where it was often exposed to contamination in various ways.

At one milk shop, where the milk was kept in the cellar, a case of diphtheria had occurred, but the sale of the milk had not been stopped during the person's illness.

Bakehouses.—These are, in some instances, old dilapidated buildings. In the case of one bakehouse, which was situated below the ground level, a large privy pit, also sunk below the ground level, was only 3 ft. distant. In several instances privies were found abutting upon bakehouses.

Common Lodging-houses. — There is no register of these kept. None that I inspected were at present, nor lately either, the proper accommodation was a very minimum one.

From the foregoing account it will be seen that the soil of the town of Hindley is naturally moist, and that the use of houses over-crowded especially owing to the defective paving of yards and to the presence of badly constructed ash-pits in the neighbourhood of, or actually under the houses. In the older houses the dampness is also increased by the absence of a "damp course," absence of eave-spouting, absence of proper flooring in some instances, and by the presence of stagnant water in their neighbourhood. The ground in the neighbourhood of houses besides being damp, is moreover saturated with filth, and this applies not only to the older houses, but to many of the newer ones also, owing to the presence of midden privies, sunk below the ground level, allowing filth to soak into the soil. In addition, in many instances filth overflows on to the surface from these privies, and is washed into the ground, owing to the defective paving. In many instances also, the house drains are in such a condition as to allow soakage of their contents into the ground, and many of the sewers similarly allow of soakage into the surrounding soil. In the case of the newer houses, on the outskirts of the town, however, contamination of the ground by filth from privies and defective drains does not occur, owing to their being provided with pail closets or with water-closets, and with efficient drains.

(b.) Prevalence of Diphtheria in the Hindley Urban Sanitary District.

It is noteworthy that no death from diphtheria was registered in this district during the year 1892; and that no cases of this disease came under the notice of the Medical Officer of Health. One death only was returned as being due to croup. Nevertheless, in the latter half of the year there was an extensive prevalence of measles in the district, complicated by throat affection. No less than 81 cases of measles came under the notice of the Medical Officer of Health, and 24 of them proved fatal. Reporting upon this outbreak of measles, the Medical Officer of Health notes that "the chief cause of the mortality seemed to "be a septic exudation on the fauces and throat, which in young "children, owing to the difficulty in applying local applications and in "feeding them, induced exhaustion." He further says that "with "regard to this complication, it did not appear to depend upon any "local sanitary defect, as it attacked children in various parts of the "town, and was as severe in the modern dwellings as in the old." On conferring with the Medical Officer of Health, he informed me that he regarded the septic exudation on the fauces and throat as being of the nature of diphtheria. No instance of paralytic symptoms or of albuminuria following this condition came under his observation; and I could not find that any such sequel had been observed by any of the medical practitioners in the town. With regard to the 24 deaths occurring from measles during 1892, six were under one year of age, 13 under two years, and five under three years; so that all the deaths occurred in children under the age of three years. During the last quarter of the year 1892, scarlet fever of a mild type became also prevalent in the town, no less than 178 cases coming to the notice of the Medical Officer of Health; and two deaths were registered in this year as being due to this disease. Throat complications, however, were not a notable feature in the scarlet fever which was prevalent in the last

the death of a child, who was a "half-timer" at the Board School, at the age of 14 years.

As to the *origin* of the outbreak of diphtheria in Hinckley:—In the first place there were no circumstances which cast any suspicion upon the water supply as the source of infection. All the invaded households were using the public supply, there were no cisterns in these houses, so that the water could not have become contaminated by storage in this way; and the disease was confined, as has been said, to the working classes, although all classes equally consumed the town water. Milk, too, as a possible cause of the disease, had to be dismissed from consideration. In many instances no milk was consumed at all, or at most was only taken with tea or coffee. Out of 46 households in which the source of milk supply was ascertained, it was found to be obtained from 14 different milk sellers; the greatest number of households obtaining milk from any one source being 17 and 5 respectively. Moreover, had the outbreak been due to infection through milk it should not have been limited to the working class households, but should have invaded also the households of the tradespeople and gentry, who, if anything, were greater consumers of milk than the other class. No information of any disease among cows at the dairies in the surrounding country district from which the milk is supplied, could be obtained; and these dairies appear to be, for the most part, clean and well ordered. At the same time the conditions under which the milk was kept for sale at the milk shops in the town were very far from perfect, and in at least one instance milk had been sold which was stored in the cellar of an infected household. No history of affections resembling diphtheria among fowls, cats, dogs, or other animals could be obtained.

With regard to emanations from the sewers and drains as a cause of the outbreak, or as a medium of infection: it was in the first place found—and careful inquiry was made as to this point—that in only three invaded households did an untrapped drain terminate inside the house. In all other instances the drains terminated outside the houses, often at a considerable distance from the dwelling. And *secondly, with* regard to the condition of the house drains, although these were in some instances very defective, still in the majority of houses in which diphtheria had appeared, the house drains were in good condition and efficiently trapped. It was also noticeable that the disease was not especially prevalent in localities the house drains of which communicated with those sewers which were in an especially defective condition, and which, as in the instance of the southern main sewer between Queen's Road and Burbage Road, contained especially large deposits of filth. With respect to the possible influence of exposure to the emanations from the sewers, which emanations undoubtedly were given forth in large quantity during the months of August and September from the street ventilators and gulleys, I did not find any instances where such emanations were likely to obtain entry directly into houses; and the houses in the neighbourhood of the open gratings ventilating the sewers were not especially invaded. It was also noticeable that the drains from the workhouse communicated with the southern main sewer at its upper end. These drains were also defective, requiring flushing, and having a privy vault emptying into them, which caused a deposit of filth; nevertheless there occurred no case of diphtheria in the workhouse, although there were 13 children under the age of 15, and 87 adult persons in the building.

In view of these considerations, therefore, I infer that sewer emanations did not act in Hinckley, either as the cause of the diphtheria or as the vehicle by which the infection was conveyed.

[redacted]

Out of the 11 persons who were the first of their families to be affected by diphtheria, and the onset of whose illness occurred at a time when they were attending a public elementary school, 20 were attending the Church schools, 17 the Board schools, five the Roman Catholic schools, and two the Trinity infant school. The number of children on the books of the Church schools was 326, on those of the Board schools 1,101, on those of the Roman Catholic schools 165, and on those of the Trinity infant school 71: so that there was marked incidence of the disease upon the children attending the Church schools.

I visited all the public elementary schools in Hinckley, and inquired into their sanitary condition, the means that were taken to exclude

although facilities for its spread among adults were present in the town, owing to the gathering together of the adults in the factories.

It will have been noticed that 61, or 89 per cent., out of 68 cases, were among children of 14 years of age or under; that is to say, among children most of whom would probably be attending school: and it has already been noted that the disease was entirely confined to the households of the working classes, that is to say, of those classes whose children would attend the public elementary schools. It is also noteworthy that, as judged by the death returns, the epidemic commenced in September after the re-opening of the schools: the first death from diphtheria which had been registered since the month of February occurring 10 days after the re-opening of the schools at the termination of the summer holidays, and being followed by a progressively increasing number of deaths from this disease; four deaths occurring in September, eight in October, and 13 in November. Out of 51 invaded households, in 44 instances, or 86 per cent., the first individual to be affected was attending a public elementary school at the time when his or her illness commenced. For the foregoing reasons, therefore, it appears most probable that the disease was spread by the means of infection received whilst attending school. The exemption of the children in the workhouse from diphtheria is in all probability accounted for by the fact that they attended school in the neighbouring village of Burbage, in which village, up to the time at which I commenced inquiry in the urban sanitary district, no case of diphtheria had occurred. At what date and in what manner the disease was first introduced into the schools, it was impossible, owing to the absence of notification of infectious diseases, and the consequent want of information as to the non-fatal cases in the earlier stages of the epidemic, to come to any conclusion. The outbreak might possibly have been preceded by mild cases, which had returned to school after the summer holidays in an infective condition, but I could obtain no evidence of this. The disease having once been introduced into the schools in whatever way, its subsequent spread is easily accounted for. It was found that in several instances *children* were attending school at a time when a member of their *family* was suffering from diphtheria; that on recovery children returned to school in the same clothes which they had worn during their illness; that they often returned to school as soon as they appeared to have recovered, without any period of further isolation; and that no attempt had been made to disinfect their houses after diphtheria had occurred in them. It will thus be seen, apart from the possibility of *children* attending school in the early stages of the disease—and setting aside the suggestion that has been put forward that some forms of sore throat without membrane are capable of communicating diphtheria—that there were abundant opportunities for communication of infection at school, both by personal contagion and from contagion carried by means of the clothes or other fomites.

Out of the 44 children who were the first of their families to be affected by diphtheria, and the onset of whose illness occurred at a time when they were attending a public elementary school, 20 were attending the Church schools, 17 the Board schools, five the Roman Catholic schools, and two the Trinity infant school. The number of children on the books of the Church schools was 326, on those of the Board schools 1,401, on those of the Roman Catholic schools 165, and on those of the Trinity infant school 74: so that there was marked incidence of the disease upon the children attending the Church schools.

I visited all the public elementary schools in Hinckley, and inquired into their sanitary condition, the means that were taken to exclude

children coming from infected households, and as to the general health and appearance of the children in them.

No markedly insanitary conditions were found in any of these schools.

With respect to the exclusion of children from school who were coming from infected households, I found that this duty was left almost entirely in the hands of the teachers. No means had been devised by which the Sanitary Authority should inform the teachers of the presence of diphtheria in the households of children attending the schools. One teacher was in the habit of excluding particular children on hearing that a medical man had been called in to see members of their household suffering from throat affection; at another school the children were only excluded on information reaching the teacher of the presence of diphtheria in their homes; and in a third the teacher sent all children home who appeared to have bad sore throats. It speaks well for the vigilance shown by the teachers, that I did not find any case presenting the typical characters of diphtheria in any of the schools, although the disease was so rife in the town. It was found, however, that in all the schools there were at the time of my visit a number of children suffering either from sore throats or from nasal catarrh; or presenting white patches at the corners of the mouth, on the mucous surface of the lips, or at the margins of the nostrils, in which latter case nasal discharge was also present.

With regard to the clinical feature of the sore throat that was present, the child suffering from it always presented a flushed, swollen, and puffy-looking face; the puffiness being especially noticeable around the eyes. The pulse was quickened, the tongue furred, and the child usually seemed dull and stupid. A distinct general puffy swelling of the tissues of the neck could be observed in many cases, and in all cases of sore throat a marked enlargement of the glands beneath the angles of the jaw on both sides of the neck was detected. On examination of the throat there would be found more or less swelling of the soft palate and fauces, with an increased secretion of mucus, which, especially in younger children, was often present in large quantity on the back of the pharynx. Swelling of the tonsils was present, in some instances, but not invariably. The most characteristic feature in the throat consisted in the presence of bright red, injected, sharply defined, patches, on the soft palate or fauces; much less commonly the surface of the tonsils was also red and injected. These bright red patches in some instances extended all along the margin of the palate. The patches of injection were often, when present on the palate or fauces, studded with enlarged projecting mucous follicles, giving them a velvety appearance. In the centre of these patches of injection was frequently found a white film or pellicle, generally most marked on the palate or fauces, but present in some instances on the tonsils. This film could be scraped off with difficulty, because it had no defined edge, nor did it stand up above the surrounding surface; on removal it left a red, slightly raw surface. The film or pellicle consisted of swollen and sodden epithelium only, and presented none of the characters of diphtheritic membrane. With regard to the characters of the nasal catarrh which was present, the discharge from the nose was in some cases thin and watery, leaving white crusts on the upper lip where it had dried; in others it was offensive and purulent. Accompanying the nasal discharge there was always more or less swelling of the mucous membrane of the pharynx, and an increased secretion of mucus from it. With regard to the cases presenting white patches at the margins of the nostrils or corners of the mouth, or on the lips, these patches consisted of white, slightly raised, swollen and sodden

epithelium, surrounded by an area of bright red injection. In m instances these patches extended some distance from the mucous me brane on to the surface of the neighbouring skin. In several instan also these white patches could be seen to extend some distance al the mucous membrane of the nasal passages, and when present ab the nose were always accompanied by a thin watery discharge, they were not observed on the mucous membrane of the mouth. Wh these white patches were pulled off, a raw, bleeding surface was left.

As to the degree of prevalence of these affections among the child present in the several schools:—They were by far most common amo the children at the Church schools; and among the children at any s school these affections were almost entirely confined to the youn children. They were almost wholly absent in the case of the ol children. The younger the child the greater appeared to be its liabil to present one or other of these affections. With regard to the relat preponderance of the three affections in question, nasal catarrh was far the most common, and in some of the class rooms, containing t younger children, nearly all were affected in this way. The form sore throat before described was also very frequently met with, in ma instances accompanied by nasal discharge; but the children presenti white patches at the margins of the mouth and nostrils were few number.

On the morning when I visited the Church schools there were o 245 children present, the number on the books for the present y being 326. The absence of above 80 children was said by the teach to be almost entirely due to the prevalence of throat affections amo them, or to the presence of undoubted cases of diphtheria in their hom Among 144 of the younger children in one room, 20 were found present enlargement of the glands of the neck, with red patches on t fauces, palate, or tonsils, and a white film or pellicle on the red inject surfaces. Of 13 boys in another room, four were suffering from t same form of sore throat. in another room six children were sufferi from this sore throat, and in a third room, two children. *A larg* proportion of the children at this school were suffering from nasal dis charge, and three presented white patches in the neighbourhoo of the mouth or nose. One teacher was suffering from sore throa and another had lately suffered from a sore throat requiring medic attendance. A comparison of the attendance of the scholars duri 1893 with that of the year 1892—the number on the books being near equal, *i.e.*, 330 in 1892 and 326 in 1893—showed that the avera attendance had not fallen off during the present year to any considerab extent until the first week in October. At this date a marked dimin tion of attendance took place, the average number of attendants bei 19 less than in the corresponding period of last year; and the numbe in the ensuing weeks, up to the week ending November 24th, were 1 10, 21, 17, 7, 18, 22, and 13, less respectively than in the correspondi periods of 1892.

At the Roman Catholic schools, the number on the books of whi for 1893 was 165, 38 children were absent. The mistress of this scho informed me that she sent home all children suffering from sore throa At this school only eight children were found suffering from so throat out of 127 present; but many others were suffering from nas discharge.

At the Trinity schools, at which infants only are admitted, there we 66 children present out of 74 on the books. Of these 66 children, on six were found to be suffering from sore thoat, and one child had whi

theria; or from children attending school from houses where diphtheri was present in circumstances allowing of the infection being carried in thei clothes. To the dissemination of diphtheria in this way by infection the absence of any provision for the notification of infectious disease neglect of systematic exclusion from school of children coming fron infected households, and disregard of disinfection of infected houses an clothing, all undoubtedly conduced.

II.—Hinckley Rural Sanitary District.

The district under the control of the Hinckley Rural Sanitary Authority has an area of 24,463 acres, and had in 1891 a population o 11,061 persons, living in 2,473 houses. The population in 1881 consisted of 9,716 persons living in 2,266 houses, so that there has been an increase in the population of 1,345 persons in the last decade. The district almost completely encircles that of the Hinckley Urban Sanitary Authority, except at one point in the south-west, where this Urban Sanitary District adjoins the district of the Nuneaton Urban Sanitary Authority. The area under the control of the Hinckley Rural Sanitary Authority embraces the parishes of Stony Stanton, Sapcote, Sharnford, Aston Flanville, Burbage, Wolvey, Burton Hastings, Stretton Baskerville, Stoke Golding, Higham, Barwell, Elmsthorpe, and Earl Shilton.

(*a.*) *Sanitary condition of the Hinckley Rural Sanitary District.*

The soil of the whole district consists for the most part of a stiff clay or marl with patches of sand in places. All the villages, with the exception of Sharnford, which is situated on the banks of the River Soar, are placed at a considerable elevation above the sea level; the elevation varying from 300 to 403 feet above Ordnance datum. There is very little intercourse between the inhabitants of the different villages, nearly all the communications taking place through the town of Hinckley. The inhabitants of the village of Stony Stanton are chiefly engaged at the quarries there, those of Earl Shilton are engaged in the manufacture of shoes, those of Stoke Golding, Barwell, and Burbage in the manufacture of hosiery, and the inhabitants of the rest of the villages are chiefly engaged in agriculture. The roads leading to the villages radiate from Hinckley as a centre, and the nearest villages to that town are two miles distant therefrom. As will presently appear, I visited all the villages at which there were public elementary schools, and inquired into the circumstances with which the diphtheria had been associated in those villages in which cases of this disease had occurred.

Water Supply.—The water supply in all the villages, with the exception of Stony Stanton, is derived from wells. The water supply of Stony Stanton is derived from water accumulating in, and pumped from, one of the quarries of the Mount Sorrel "Granite" Company. The water is pumped into a filter, through which it passes into a tank from which it is distributed in pipes by gravitation. This supply has only been introduced during 1893, and many of the houses in the more outlying parts of the village are still supplied from wells which are undoubtedly polluted by privies, pigsties, and faulty house drains, in their neighbourhood. At Burbage there are six public wells, which appear to be free from pollution; and also many private ones, the water from which also appears to be of a satisfactory quality. At Sapcote there is no public water supply; but the wells, which are situated in gardens at some distance from houses, appear to be free from risk of pollution in most instances. Some, however, were observed in dangerous

On Diphtheria in Hinckley U. and R. Districts; by Dr. Wheaton.

(b.) *Diphtheria in the Hinckley Rural Sanitary District.*

With regard to the prevalence of diphtheria in the Hinckley Rural Sanitary District, it should be in the first place noted that in 1890, in which year the Infectious Disease (Notification) Act first came into force in the district, no cases of diphtheria were notified to the Rural Sanitary Authority, although one death was returned as due to this disease. In the year 1891 no cases of diphtheria were notified, and no deaths were returned as being due to this disease. In 1892 five cases of diphtheria were notified to the Rural Sanitary Authority, two in Stony Stanton, and one each in the villages of Sharnford, Burbage, and Barwell; and one death occurred from this disease. During the latter part of 1892 scarlet fever of a mild type appeared in the district; 45 cases were notified at Stony Stanton, and a few cases in the villages of Sharnford, Earl Shilton, and Barwell. Two deaths from scarlet fever also occurred in this year. Measles does not appear to have been prevalent in the district in 1892, except at Stony Stanton, in which village a number of cases occurred in the autumn. Dr. King, the only resident medical practitioner in this village, informs me that several persons attacked by measles suffered from throat complications, and two fatal cases presented a false membrane in the throat. At the latter end of 1892 and the beginning of 1893 several instances of scarlet fever with throat complications, some of them presenting distinct membrane on the fauces, were observed by Dr. King at Stony Stanton. During 1893 the first case of diphtheria occurring in the district was notified on January 26th; in this month three cases were notified, in February three cases, in March two cases; in April one case, in May two, in July two, in August three cases were notified; all in the village of Stony Stanton. In October three additional cases were notified in Stony Stanton, one case at Stoke Golding, and one in the hamlet of Sketchley in the parish of Burbage. In November one case was notified from Stony Stanton, one from a farmhouse in the parish of Burbage, another from an isolated row of cottages in the same parish, one at Barwell, and one at Earl Shilton; making altogether 26 cases of diphtheria notified up to November 28th, 1893. Seven deaths were returned as due to this disease in the same period. Four of these deaths occurred at Stoke Golding,* one at Stony Stanton, and two at Earl Shilton. In the course of my inquiry it was found that some cases of diphtheria had not been notified, and that at least 34 cases of diphtheria had occurred in the district up to November 26th. I visited all the houses in which, so far as I could ascertain, cases of diphtheria had occurred; as also the public elementary schools in all the villages at which such schools existed. In these visits I was accompanied by Mr. W. D. Bennett, the Inspector of Nuisances, whose extensive knowledge of the district, and of its sanitary condition, was of great assistance to me in my investigations. In the course of inquiry it became evident that the origin and progress of the diphtheria could not be attributed to infection through the medium of water or milk. It was also found that the prevalence of the disease bore no obvious relation to the existence of insanitary conditions, such as dampness of

* It will be noted that four deaths from diphtheria occurred at Stoke Golding, whereas only one case of this disease (a late case of a series) had been notified to the Sanitary Authority as occurring in this village.

died on October 5th. With regard to the boy last mentioned, it seemed at first probable that he had contracted diphtheria infection on returning home, notwithstanding that the house had been disinfected; but I found that he had suffered from sore throat on or about August 29th, that is to say, at a time when his sister, aged 11, also had sore throat, and it appears to me to be more probable that this was an instance of recrudescence or relapse of diphtheria in a child who had already suffered from a mild attack of the disease.

With regard to the origin of this limited but fatal outbreak of diphtheria:—I found that early in August four children living in a cottage next door but one to the cottage in which the child, which apparently was the first of those attacked during the outbreak, was staying, had suffered, from what were said by the medical man called in to attend them to be slight attacks of diphtheria. The first of these children, a girl, M. P., aged seven years, was attacked on or about August 16th. One of these children, a female aged 10 months, died on September 16th, the cause of death being returned as "diphtheritic "ulceration of the thigh." It appears that this child, after suffering from sore throat, had some swelling of the vulva, and a sore place, which was said to be covered with a "white substance," appeared in the right groin. It therefore seemed probable that the child, who died in the cottage next but one on August 25th, contracted the disease by infection from the girl M. P., since there was a good deal of communication between the inhabitants of the two cottages; and that the subsequent cases in both families arose from contagion carried from one child to another. With regard to the origin of the infection in the first instance, it appears that a fair was held in the village on August 6th, at which the child, M. P., was certainly present, together with other members of her family. This fair was attended by many persons from Hinckley and the surrounding villages, and ice creams and other articles of food brought from Hinckley were sold there. It is possible that the infection may have been contracted at this fair, although the child, M. P., was not discovered to be ill until about 10 days afterwards.

The building in which the school is held at Stoke Golding was not intended for that purpose. The boys' school is light and fairly well ventilated, but the girls' and infants' schoolroom is partly below the level of the road; moreover it is situated under the boys' school and is badly lighted and ventilated. The room is also barely 10 feet in height. All the children appeared healthy in the boys' school. In the girls' and infants' room there were, out of 63 children, 12 suffering from nasal discharge, and five suffering from sore throat of the character already described. The mistress also was suffering from sore throat. It should be noted that at the time at which the outbreak of diphtheria occurred in this village, the school was closed for the summer holidays, and this may explain the fact that no further cases of diphtheria have occurred there up to the present time.

(3.) *Diphtheria at Earl Shilton.* (Population, 2,594.)

A localised outbreak has occurred in this village, which has been confined to two households up to December. The first attack occurred in the person of a boy, F. F., aged four years, who was taken ill on November 4th and died on November 13th. The house in which this

case occurred was one of a group of four cottages, the sanitary condition of which presented nothing noteworthy, except that the yard at the back was damp, and that there was an uncovered privy midden some distance away from the houses, the use of which was common to all the occupiers of the cottages. This child was attacked eight days after a fair was held in the village, at which, as at Stoke Golding, many people were present from Hinckley, and at which also food brought from that town was sold. The illness of this boy was followed by the illness of a female living next door, who had frequently visited the child when ill. Three of this woman's children were subsequently attacked, and one of them, a male infant, aged 16 months, died on December 10th. In this instance, also, it therefore appears probable that diphtheria infection was brought from Hinckley by persons attending the fair, at which the first recorded case was present; and that the disease spread subsequently by infection there can be no doubt.

The schools at Earl Shilton are well built, and the schoolrooms well ventilated; the privy accommodation for the boys is, however, defective, since all the privies empty into a large vault in the playground, which is said not to have been emptied for some years.

At the date of my visit, there were no cases of sore throat among the children at these schools, and the children had a healthy appearance.

(4.) *Diphtheria? at Barwell.* (Population, 2,022.)

A case of diphtheria was notified here on November 9th. On making inquiry, I found that the child had, together with two other children at the same time, presented a scarlet rash upon the trunk and arms. At the time of my visit, a child in the next house presented a typical scarlet fever eruption, with severe sore throat, but without formation of membrane. For these reasons I am inclined to think that the case which was notified as diphtheria was probably one of scarlet fever with severe throat affection.

The schools at Barwell are well built and well ventilated, *with the* exception of one class room in the boys' department, which *was badly* ventilated. All the children in these schools had a healthy appearance, and there were no instances of sore throat observed among them.

(5.) *Diphtheria at Burbage.* (Population, 1,876.)

Three attacks of diphtheria have been notified at outlying houses in this parish, but none in the village itself. One attack occurred in the person of a servant at a farm house, a short distance from Hinckley, who probably contracted the disease at Hinckley, to which place she frequently went. Another attack occurred in the person of a boy living in a cottage near Hinckley station, but in the parish of Burbage. The cottage was a new one, and in good sanitary condition, and no other attacks occurred in this household. The boy was attending the Church school at Hinckley at the time when he was taken ill, on October 24th, so that he probably contracted the disease by infection at school.

The third case in this parish occurred in a row of cottages on the roadside leading from Hinckley to Burbage. The child, a girl aged five years, was attending the National School at Burbage when attacked on November 24th. The mother of the child was, however, usually away all day at work in a factory at Hinckley, so that it is possible that she

carried the infection to her house by means of food or clothing. The house in which this child lived was damp and dirty, and two younger children, who were not attending school, presented, at the time when I saw them, a fœtid nasal discharge, with white patches at the margins of the nostrils.

There are two schools in this village. The National Schools are well built, and in good condition from the sanitary point of view. The children in these schools had for the most part a healthy appearance; a few were suffering from colds, but there were no children observed who presented any sign of sore throat. At the Wesleyan School the boys' department is light and airy, but the girls' and infants' department is a low, badly lighted room, under the boys' school, and its ventilation is imperfect. Against the walls of this room the school privies are placed. The children in this school, however, appeared to be healthy, and there were apparently none suffering from sore throat.

As to the other villages in which there were schools, but in which diphtheria was not known to have appeared, namely, the villages of Shapcote (population 732), Wolvey (population 715), Sharnford (population 361), and Higham (population 353), the schools were generally in good sanitary condition, and not overcrowded, and the privy accommodation satisfactory. At Higham, however, the privy for the girls' school contained a large amount of liquid filth, apparently owing to slop-water being thrown into it. No affections of the throat, nose, or mouth, were found among the children at any of these schools, except at Higham. Here a girl in the school was found to have a severe attack of sore throat, with a white pellicle on the tonsils; and her brother, who was absent from school on account of sore throat, presented bright red patches on the palate and fauces, with enlargement of the glands of the neck. Many children, too, in this school were found to be suffering from nasal catarrh. On inquiry, no history of illness in the village resembling diphtheria could be obtained. It may be noted that the population of these four last-named villages is almost entirely engaged in agriculture. The population of the remaining parishes of Aston Flanville, Burton Hastings, Stretton Baskerville, and Elmsthorpe, is very small—369 in all. There are no schools in these parishes, and the houses are much scattered. No diphtheria has recently occurred in either of these parishes.

With respect to the origin and spread of diphtheria in the Hinckley Rural Sanitary District, it would appear from the foregoing history that the source of the disease at Stony Stanton was obscure. It is noteworthy, however, that at this village throat complications, accompanying scarlet fever and measles, preceded the outbreak of diphtheria, just as they had preceded the diphtheria outbreak in the town of Hinckley. With regard also to the spread of the disease in this village, it occurred almost entirely through contagion received at the school; as was also the case at Hinckley. With regard to the localised outbreaks in other parts of the district, the disease appeared to have been in two instances (Stoke Golding and Earl Shilton) conveyed by infection through the medium of fairs, and to have spread by personal contagion. With respect to the isolated cases occurring in other parts of the district, they appeared to be due to infection from Hinckley—in one instance through attendance at school there.

With regard to the prevalence of sore throat and allied affections of the mouth and nose among children attending the village schools, it will have been noted that, with the exception of the village of Higham, these affections were present among the school children only in those

villages in which cases of diphtheria had occurred in the village itself and where it was possible that children had returned to school after recovery from diphtheria; namely, the villages of Stony Stanton and Stoke Golding: so that it appears to be highly probable that these affections are related directly or indirectly to diphtheria. No relation was discovered in the Rural Sanitary District between the prevalence of these last-named affections among children and insanitary conditions of their homes or of their surroundings.

No. 11.

Report on an Outbreak of an Epidemic Skin Disease; by Dr. S. Monckton Copeman.

I.—BETHNAL GREEN INFIRMARY.

In May 1893 the Board learnt, through Dr. Downes, of the occurrence in the sick wards of the Bethnal Green Workhouse of about 50 cases of epidemic skin disease "similar," as Dr. Downes says in his minute (of May 19th) on the matter, "to the serious and fatal form which prevailed "in Paddington and Marylebone Infirmaries two or three years ago."

About the same time a letter was received from the Clerk to the Bethnal Green Guardians in which he states that he is directed to inform the Board that "a serious epidemic of contagious skin disease has broken "out in the infirmary of the workhouse," and asking that the Board would at once give instructions for an inspector to visit the place to inquire into the causes of the disease, and also to advise as to the treatment of the cases.

An investigation of the circumstances of the outbreak was, in consequence, ordered by the Board, and I received instructions to undertake it. At the same time the Guardians were informed that if they were desirous of obtaining the services of an expert for the purpose of advising them as to the treatment of the cases, it would rest with them to obtain such services. They were, however, given to understand that no parallel inquiry as to the cause of the outbreak should be undertaken by anyone employed by them while the matter was under investigation by the Board.

Previous History of the Disease.

More than two years prior to the outbreak in the Bethnal Green Workhouse Infirmary a large number of similar cases had come under observation in other of the Metropolitan infirmaries, and it is therefore desirable in the first place to submit a brief outline of the history of the disease up to the time of the outbreak at present under consideration. This is well given in a minute (of date May 22nd, 1893) by Dr. Downes, which I therefore append—

"Attention was first directed to it (the skin disease in question) "in 1891 by Dr. Savill, the then Medical Superintendent of "Paddington Infirmary and Medical Officer of the Paddington "Workhouse. Dr. Savill has since published a valuable account "of this serious malady.

"Of 846 patients who passed under treatment in the sick wards "of Paddington Infirmary and Workhouse between July 1st and "October 31st, 1891, 163 or 19·2 per cent. were attacked by this "skin disease and 28 of them died. Seven of the 28 succumbed "chiefly to some other disease, but in 21 or 12·8 per cent. of the "cases 'death was directly dependent on the epidemic malady.' "This skin disease, therefore, seriously endangers life.

"It was at first called epidemic eczema, because of the close resem- "blance of many of the cases to the raw and weeping state of skin "not uncommonly known as acute general eczema. But Dr. Savill "has advanced weighty reasons to show that the disease now in "question is distinct from ordinary eczema.

App. A. No. 11.

On an Outbreak of Epidemic Skin Disease; by Dr. Cogman.

"Essentially it is an inflammation of the skin, sometimes dry, "sometimes moist and discharging, but always attended by more or "less peeling of the cuticle. In some cases this exfoliation is so "extensive that the whole cuticle of the hand may come off like "a glove, and the bed is often filled with flakes and scales.

"The whole skin from head to foot may be attacked. In severe "cases of the 'moist' type weeping cracks, and extensive red raw "surfaces are formed and a sickening odour is given off. The eyes "are commonly inflamed and discharging.

"In some of the worst-looking cases the patients have told me "that they felt no pain. Dr. Savill, however, states that in a "typical case the skin is 'raw and acutely tender' with 'intolerable "'itching and burning.'

"The average duration of the disease is six to eight weeks. In "fatal cases death usually comes by profound weakness with "drowsiness, deepening at last into coma.

"There are all degrees of severity and many varieties both in "the condition of the skin and in the constitutional symptoms.

"Of the causes of this singular disease we know practically nothing, "and, in the absence of such knowledge, are almost powerless to "prevent it. It was not wholly confined to Paddington.

"They had had some cases in Marylebone Infirmary, also in "Lambeth Infirmary, in 1891, and there is some recollection of an "outbreak in 1888 in a Scotch Poorhouse (Greenock), where some "50 persons were attacked and 12 died.

"The disease in 1891 was less severe in Marylebone than in "Paddington Infirmary—the death-rate being only 5 per cent. "of the 193 persons attacked. I understand that St. Mary's "Hospital had four cases with one death in 1891, and that there "was a solitary but fatal case in the Female Lock Hospital. At "Hanwell Asylum 38 cases occurred, and at Lambeth Infirmary "25 cases in 1891.

"In the provinces and elsewhere in London the disease was not "observed at that time.

"It is a disease chiefly of hot weather, July and *August being* "the months in which the great majority of cases occurred. It has "a distinct preference for sick wards, and most of the sufferers are "persons advanced in years. Children and young persons are but "slightly attacked.

"There is reason to believe that it is contagious. Dr. Savill "himself had a slight attack, the Medical Officer of Bethnal Green "Workhouse also has caught it, so did seven out of eleven wards-"people or pauper nurses in Paddington Workhouse sick wards.

"Soap has been suspected, but apparently excluded.

"Dr. Savill considered that there was no evidence to inculpate "any article of dietary, but he remarks that the same contractors "supplied milk and fish to both Paddington and Marylebone, and "the Medical Officer of Bethnal Green, though rightly expressing a "very guarded and cautious opinion, is struck by the present "exemption of the workhouse proper and the infirm wards where "little milk is used, as compared with his sick wards.

"I hope I have said enough to indicate the gravity of this disease "and the importance of careful and systematic study of every "appearance of it."

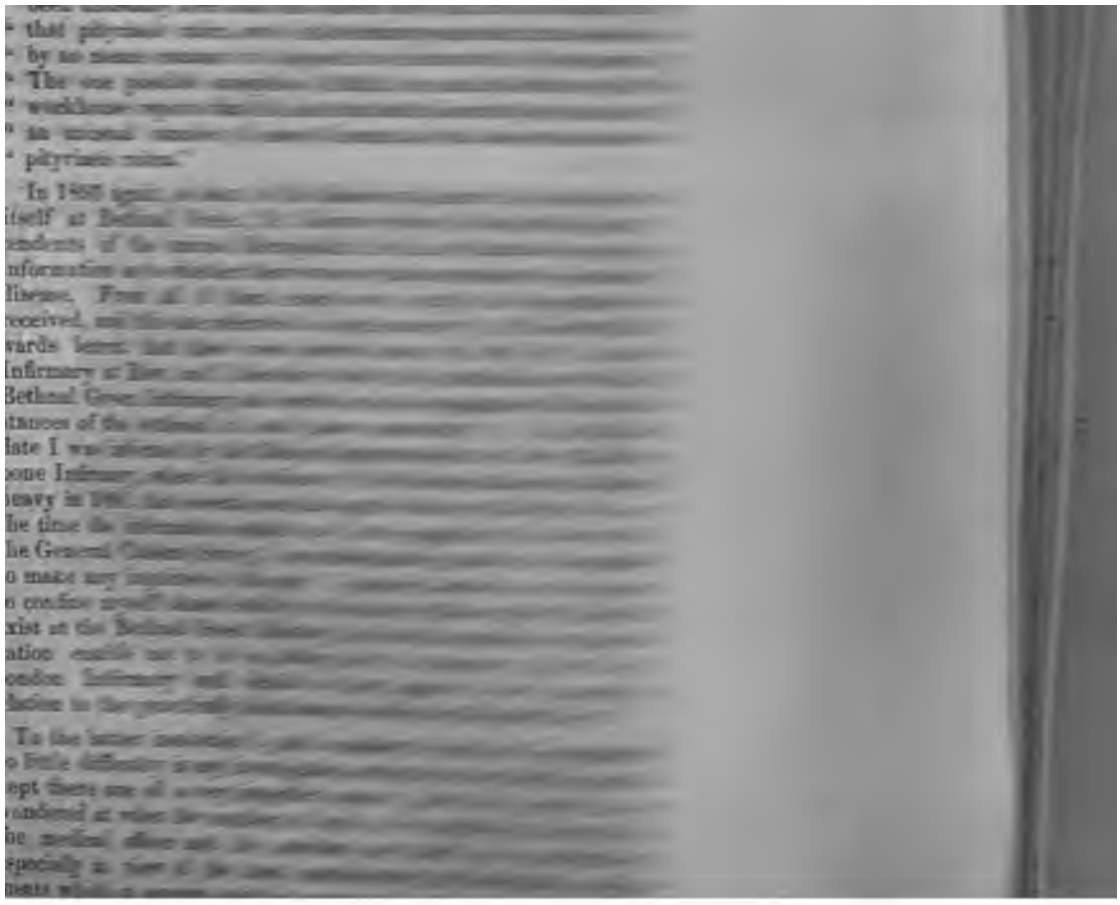
I found from office records that Dr. Downes had at the time of the first known prevalence of the disease in 1891 sent a circular letter to the medical officer of those provincial workhouse infirmaries (115 in

number) which have over 100 beds each, asking if they had observed during the current year any unusual number of cases of acute general eczema or of pityriasis rubra. On 13th October 1891 he notes that he had received 80 replies. "From these," he says, "it is clear that, with "one possible exception, there has been nothing of the kind in the "workhouse infirmaries to which these replies relate. It is, indeed, "remarkable how many of the medical officers state that they have "been unusually free from skin cases this year, and it would appear "that pityriasis rubra, even in its ordinary sporadic form, is a disease "by no means common in the poor law sick wards of the provinces. "The one possible exception is Bath, the medical officer of which "workhouse reports that he has had under his care this year not only "an unusual number of cases of eczema, but also several cases of "pityriasis rubra."

In 1893 again, as soon as the disease was known to have declared itself at Bethnal Green, Dr. Downes wrote to the medical superintendents of the various Metropolitan Poor Law Infirmaries requesting information as to whether there was any undue prevalence of eczematous disease. From all of them except one a reply in the negative was received, and this one referred to a single case only; but I shortly afterwards learnt that there were several cases at the City of London Infirmary at Bow, and I therefore visited this institution as well as the Bethnal Green Infirmary and carried out an investigation of the circumstances of the outbreak in both places concurrently. At a still later date I was informed by the Medical Superintendent of the St. Marylebone Infirmary, where the incidence of the disease had been extremely heavy in 1891, that several cases had again broken out there, but as at the time the information reached me I was engaged with the work of the General Cholera Survey, I was unfortunately unable in this instance to make any inquiries on the spot. I propose, therefore, in this report to confine myself almost entirely to the state of affairs which I found to exist at the Bethnal Green Infirmary, as far as the results of my investigation enable me to do so, adding only in reference to the City of London Infirmary such details as may appear to be of interest in relation to the practically simultaneous outbreak at Bethnal Green.

To the latter institution I paid a number of visits, but I experienced no little difficulty in my investigation, owing to the fact that the records kept there are of a very imperfect nature. And this is hardly to be wondered at when the numbers of sick to be attended in the wards by the medical officer and his assistant are taken into consideration, especially in view of the most unsatisfactory and inadequate arrangements which at present exist for nursing the patients in this institution. With this subject it will be necessary to deal at a later stage of this report.

In Addendum B. is given a complete list of all patients attacked at the Bethnal Green institution between May 4th, 1893, when the disease first appeared, and June 10th, 1893, between which dates 86 cases are known to have occurred. All these cases, with five exceptions, broke out in the sick wards of the Infirmary; the Workhouse, with the exceptions mentioned above, together with the infirm wards of the Infirmary, which are practically in one building, have remained completely free; and this, notwithstanding that patients who are well enough mix daily in the airing yards and day rooms which are common to the Workhouse and the Infirmary alike. It is also worthy of note in this connexion that the inmates of the Workhouse have every day to pass through a portion of the Infirmary in order to reach the dining hall.



Ward No. 28. Although this precaution was carried out, two further attacks occurred in Ward No. 26, one (No. 60) on May 22nd, and another (No. 70) on May 25th. Again, case No. 3 was in like manner removed from Ward No. 15 to Ward No. 22, on May 4th, but two other cases cropped up in Ward No. 15, from which this patient was removed, at intervals of 20 days (No. 70), and of 23 days (No. 73) respectively. In Ward No. 22 *to which* the patient was removed on 4th May, further cases afterwards appeared, as is shown in the following table :—

No. of Patient in List.	Date of Attack (Eruption).
30	May 12th.
35	May 14th.
36	May 14th.
43	May 16th.
53	May 20th.
57	May 21st.
64	May 22nd.

Symptoms: Constitutional and Subjective.

At the Bethnal Green Infirmary the amount of work devolving on the medical officers, who are not provided with clinical assistants, is so great that it is impossible for them to keep proper records of the medical history of the large number of patients admitted. I am therefore unable to append any detailed account of the progress of the disease as witnessed in the cases which came under treatment during the prevalence of the epidemic at this Infirmary.* I found, however, that the Assistant Medical Officer of the City of London Infirmary at Bow had preserved notes of certain of the cases which he had under treatment in March, April, and May 1893, and although these notes are not in all respects as full as could be wished, still, as they give some detailed account of the more prominent symptoms which obtained among the patients suffering from this disease, I think it desirable to place them on record here.

Case No. 1.

Name : Annie M——, aged 45.
Occupation : General Servant.
Date of admission : September 14th, 1892 (fourth time).

This patient was re-admitted to the Bow Infirmary in September 1892, complaining of rheumatism, she having been under treatment there in 1888 for "eczema capitis." In October 1892 she showed signs of mental weakness, with paroxysms of violent temper ; was aggressive, showed loss of memory, &c., and was consequently entered with the imbecile and insane class. About the same time her appetite began to fail, and she was complaining of sleeplessness and general debility, with slight gastric disturbance, loss of appetite, nausea, flatulence, and constipation. She was treated with light and nutritious diet and stomachic tonics. There was for a time marked improvement. On March 6th, 1893, however, she complained of an intolerable irritation of her face and forearms for the relief of which she scratched herself. A circumscribed papular eruption made its appearance, which soon ran together and spread itself over the

* I append to this report photographs of certain of the Bethnal Green cases, the originals of which were taken by Dr. F. J. Warwick, who has kindly allowed them to be reproduced. Each photograph is accompanied by a short clinical note supplied by Dr. Knox, the Medical Superintendent.

There was a semi-fœtid discharge from the meatus. On closer examination the affected surface was seen to be studded with minute whitish papules. There was a serous exudation on to the surface. Her temperature rose (not higher than 101°) for about four days, accompanied with the usual febrile disturbances. Urine contained no albumen. She was treated with diaphoretics until the temperature fell, and the ear was syringed with Condy's fluid. The surface of the skin was subsequently rubbed with ol. amygd. and acid hydrocyanc. dil., which at once relieved the irritation. Her general condition soon improved. The discharge from the ear ceased in 14 days, and much of the erythema about the patch disappeared, leaving it scaly, harsh, and dry. But fresh patches appeared now on the forehead, and the eyelids became swollen and œdematous. On April 24th the patient was delirious, but had no marked rise of temperature. A brisk purge removed head symptoms and produced a good night. There has been no relapse since. Later the hair of her scalp began to fall off, as also did that of her eyelashes and eyebrows. The whole face, head, neck, and upper part of chest gradually became involved, the skin becoming erythematous and scaly, with still an intolerable itching. Her appetite is now good and general condition much improved. (*See* Chart No. 1.)

Case No. 4.

Name: Maria B——, aged 67.
Occupation: Housewife.
Date of admission: June 10th, 1891.

Patient has been an inmate of the Bow Infirmary since 1891, suffering from "debility and destitution."

There is no organic disease that can be detected, but she seems to be prematurely "used up," and a person of delicate constitution.

On April 29th, 1893, the nurse said she thought the woman seemed "very ill," and had refused to take her food. Although a careful examination was made at the time, I could discover nothing to account for her altered condition. Her temperature was taken at the time, but was not above normal. The next morning, however (30th), she had a temperature of 103·1°, and towards midday her body was completely covered with a macular eruption resembling "measles." In fact, it was diagnosed as such, inasmuch as an outbreak of measles was at the time prevalent amongst the children on the floor above. There were well-marked febrile symptoms, with a trace of albumen in the urine. On the morning of the fifth day the temperature began to yield to simple saline treatment (liq. ammon. acet. ʒi. every four hours), and fell to subnormal on the seventh day.

The albuminuria also disappeared. The skin desquamated, and subsequently came away in large flakes, and then cracked at the elbows. It was not until this time that the disease was recognised as similar to the other cases of "skin" disease occurring in old infirmary patients. Even at the present time (June 1893) the skin shows traces of the attack. (*See* Chart No. 2.)

Case No. 5.

Name: Mary J——, aged 45.
Occupation: Charwoman.
Date of admission: October 4th, 1892.

The patient came into the Bow Infirmary for the first time in July 1891, suffering from morbus cordis (acute rheumatism when young), with all the classical "secondary results." At one time her condition was so serious that she was on the "dangerous list," but in spite of all she recovered sufficiently to be able to leave the infirmary in June of the following year. She was re-admitted again on October 4th, 1892, with many of the old symptoms, but of less severity than on the former occasion. By Christmas she was again up, and moving about the ward, and wanted to go out, but was dissuaded from so doing. She was enjoying her

condition now (June 12th). Altogether his [is the mildest case we have had.

Case No. 9.

Name: Mary B——, aged 84.
Occupation: Housewife.
Date of admission: April 7th, 1893.

The patient was sent from Homerton Workhouse to the Bow Infirmary on April 7th, 1893, with "psoriasis guttata" of the elbows and knees. She had had eczema and gout some years ago. She was in the same ward with, and a few beds removed from, another patient who had suffered from "epidemic skin disease" (F. L——), and on May 30th the nurse noticed that she had a copious eruption upon her. On examination it was found to be scaly and resembled the other cases, although there has been a total absence of any constitutional disturbances.

It is interesting to note that in one respect at any rate, the course of the disease, as witnessed in 1893 at Bethnal Green and at Bow, differed from that observed in 1891, at Paddington and Marylebone.

I refer especially to the *body temperature* of patients who were attacked by it. Dr. Savill notes, with reference to this subject, that "the temperature during the earlier period of the eruption was "generally normal, or in many of the older patients subnormal. In "the later stages, when the skin became extensively or severely "inflamed, it went up to 99°, or sometimes 100° in the evening, and "generally down again to normal in the morning. A higher tempera-"ture than this usually indicated the formation of boils or some other "local inflammation."

One of three temperature charts (annexed to this report) of patients in the City of London Infirmary shows a temperature of 103° F., coincident with the appearance of the eruption, and, as far as I have been able to learn, an initial temperature only a couple of degrees lower was not unfrequently noticed both in this Infirmary and also at Bethnal Green, more particularly in those patients in whom a copious eruption appeared at an early stage of their malady. In such cases, the temperature, however, usually fell again after a day or two, but occasional rises during the later progress of the disease were sometimes observed, the cause for which was, for the most part, not at all obvious. The appended charts illustrate these points.

For the rest, the symptoms and course of the disease have been so well and thoroughly dealt with by Dr. Savill, in his description of the Paddington outbreak, that it is unnecessary in this place to go again over the same ground. It will suffice to note the fact that the disease, as it showed itself at Bethnal Green, was indistinguishable clinically from that of the Paddington and Marylebone epidemics; the two varieties of disease, moist and dry, respectively, referred to by Dr. Savill having been intermixed with cases representing every intermediate stage.

Etiology.

In order to facilitate comparison with the experience of the Paddington outbreak of 1891, as reported by Dr. Savill, I give here the results of my own investigation at Bethnal Green, under similarly arranged headings.

A.—Predisposing Causes.

1. ***Age.***—With very few exceptions, the patients attacked at Bethnal Green were advanced in years; no children suffered from the disease,

measure on the fact that the sanitary condition, and also the general arrangements for attendance on and treatment of the patients in the Bethnal Green Infirmary leave much to be desired. The greater number of the wards, on all three floors, are arranged on either side of a central corridor, so that efficient "through" ventilation is not easily attainable. Moreover, the window space is insufficient, as is also the cubic and floor space in relation to the number of patients in each ward, and in consequence an unpleasant "fusty" smell was noticeable on going into many of the wards.

The nursing staff provided was, under these circumstances, inadequate for the needs of the place, and sufficient attention therefore could not be given to the cleanliness of the patients, or of their body or bed-clothing. At the time of my inquiry I found that one and the same nurse was supposed to exercise a general supervision of several wards. Under this nurse a number of wardsmen or wardswomen were employed to distribute the dietaries and look after the patients in various ways. These wardsmen and wardswomen were more or less able-bodied paupers, who were distributed through the Infirmary by day, but who slept in the Workhouse at night. In most of these respects the Bethnal Green system was at disadvantage compared with that of other Metropolitan infirmaries.

B.—Exciting Causes.

The fact that the special symptom, loss of appetite, was observed in a number of persons at one and the same time, with the circumstance that the eruption characteristic of the malady appeared on the same day in seven of these persons distributed in six wards, seemed suggestive of a cause of the outbreak common to a considerable number of people, and led at once to suspicion that some particular article or articles of *food* might have had concern with the outbreak.

This being so, I carried out a detailed inquiry into the matter, having previously, however, turned my attention to certain other points which may first receive brief mention.

For instance, as in previous outbreaks at the Paddington and Marylebone Infirmaries, suspicion had fallen on *soap;* but it soon appeared that this view was untenable, owing to the fact that the same quality of soap had been in use for some considerable period prior to the outbreak.

Irritation of the Skin from coarse flannel vests and from the easily dissipated blue stains of new bed-coverlets was also suggested as perhaps conducing to the outbreak. But these vests did not cover the arms of patients on which the eruption not infrequently first appeared, and new bed-covers had not, I found, been supplied to all those persons first affected.

Yet another suggested factor was the *Regent's Canal*, which is in a very foul condition, and passes within about 50 yards of the ward in which the first patient to be attacked was lying. Not only is there, especially in hot weather, considerable nuisance from the condition of the water itself, but large cargoes of guano, gas refuse, and decomposing bones for manure add their quota to the effluvium. On inquiry at Paddington Infirmary I found also that the canal runs within a few yards of the base of the main ward-pavilions. Although this was so, I was unable to find any reason for supposing that this coincidence had any definite bearing on the matter under consideration, especially as the canal does not run in any such propinquity to the Marylebone or City of London Infirmaries.

The *water supply* is different in each of the several infirmaries that have been affected, and in the case of that at Bethnal Green is obtained

The milk consumed both in the Workhouse and Infirmary was, I learnt, supplied by Messrs. A——, of Homerton, who themselves obtained their total stock from numerous farmers (usually about 150) in different parts of the country. From these sources Messrs. A—— received 1,100 to 1,200 barn gallons daily, delivered at St. Pancras Station.

From the station it is distributed by means of carts directly to its destination.

I further learnt from Messrs. A—— that, although in former years they had supplied milk to the Bethnal Green Workhouse and Infirmary, their contract had lapsed for a year from March 27th, 1892—March 28th, 1893, when they again obtained the contract.

These same contractors had, I found, been supplying, uninterruptedly for the past four years, milk to the City of London Infirmary at Bow, where, as already stated, a number of cases of the disease were observed in 1893 almost synchronously in point of time with those at Bethnal Green.

Another public institution, as they informed me, was also being supplied by these contractors, namely, the Victoria Park Hospital for Diseases of the Chest. At this institution, as far as I am aware, no cases of similar disease have been observed.

A number of smaller dealers are also supplied by Messrs. A——, but I did not attempt any investigation of possible incidence of the disease on this portion of the milk-services; the extreme difficulty of the task would in all probability have been incommensurate with any useful results likely to have accrued therefrom.

With reference more particularly to that portion of Messrs. A——'s milk received at St. Pancras Station, which since March 25th, 1893, was distributed to Bethnal Green Workhouse and Infirmary, I learnt from Messrs. A—— that they require a guarantee of quality from every farmer supplying milk, and that in consequence they do not take any special precautions with reference to this point, except that occasionally the amount of cream in the milk from a particular farmer is estimated if complaint has been made by customers believed to have been receiving it. The utility of such a course, however, does not appear very obvious as, up to the time of the appearance of the epidemic at Bethnal Green, the labels containing the names of the farmers had, as a matter of routine, been taken off the churns at St. Pancras, and forwarded to Homerton, *before* the milk was distributed in larger or smaller quantities under the direction of the foreman at the station. In these circumstances it was not possible to say in what direction the milk received from any particular farmer had been distributed.

The average amount which had been supplied to the Workhouse and Infirmary in 1893 was, I learnt, four churns daily, containing about 16 barn gallons, at a contract price of 13*d.* per gallon. The Medical Superintendent informed me that from the commencement of the new contract in March 1893, the quality had been very inferior, the amount of cream never having reached five per cent. in any specimen examined, and frequently not being more than from two to three per cent.

On April 22nd four churns were received at Bethnal Green, having on them name-plates as follows:—

1. T. S——, Rochester, 379.
2. E——, Wissendine, 215.
3. K——, Duffield, 49.
4. T. S——, Rochester, 910.

malady; along with certain observations of my own in this direction, undertaken before Dr. Andrewes had, at the Board's instance, become associated in my inquiry for the purpose of detailed study of the pathological questions that were seen to be arising.

At the time of the former outbreak of epidemic skin disease at Paddington Infirmary, the bacteriology of the disease was made the subject of study by Dr. Savill, and more particularly by Dr. Risien Russell, who published the results of his work in the "British "Journal of Dermatology" (No. 42, Vol. IV.). Dr. Russell states, however, that his opportunity for such work unfortunately only came towards the end of the epidemic, so that the amount of material at his disposal was somewhat limited.

The general plan of his research may best be given in his own words:—

"1. The skin of patients suffering from the disease was examined "microscopically for micro-organisms.

"2. Artificial nutrient media (tubes of peptone broth) were "inoculated with blood which was withdrawn from the bodies "of such patients, during life in some cases, and after death in "others.

"3. The under surface of flakes of epithelium, detached from the "bodies of patients, was also employed for inoculating artificial "nutrient media.

"4. The broth culture was used to inoculate gelatine, from "which plate cultures were made in order to separate the colonies, "and from such isolated colonies pure cultures were made on "gelatine, agar-agar, and potato.

"5. From such pure cultures coverglass preparations were made "and various colouring agents used to bring the micro-organism "into evidence.

"6. Animals were inoculated with pure cultures of the "organism.

"7. Finally, control experiments were made. (*a.*) Sections of "skin of patients who were not subjects of the disease were "prepared and stained for organisms exactly as had been done "with the sections of skin from patients suffering from the "disease. (*b.*) Artificial nutrient media were inoculated with the "blood taken from the cavities of the hearts of patients who had "died of some other disease."

As the result of these experiments a particular micro-organism was found in the skin, in a specimen of blood which had been obtained post mortem, and in the skin exudations of patients suffering from this disease, and Dr. Russell considers "that there are ample grounds for "suggesting that probably . . . an etiological relationship between "the organism and the disease does exist."

He further states that in certain respects this organism resembles the staphylococcus pyogenes albus, but distinguishes it from the latter mainly from the fact that the organism found by him in this disease does not liquefy gelatine.

Like Dr. Russell, I myself found that inoculations of blood, exudation, and flakes of skin from affected areas in various nutrient media (which included broth, peptone, gelatine, and agar-agar) gave rise for the most part to colonies of a glistening bluish-white colour, and consisting of a staphylococcus which only liquefied gelatine after the lapse of some considerable time. Occasionally other organisms were found of

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...known as common inhabitants o
... much importance to cultivation
...squamating skin. The norma
...ne, and in diseased conditions i
...he chief organism present in th
... matter was staphylococcus epider
...nism in healthy skin, and perhap
...nogenic variety of staphylococcu
... cultures with those obtained
... cannot state whether thei
... und. Their descriptions, how
... description of his staph
... why I attach little importanc
... that the disease would appear t
... ver layers of the epidermis, which
... n. Yet these layers, in practically
... nd to be free from micro
... methods could show.
... my observations during
... the demonstration of any
... eczema have been negative.
... the internal organs in fatal cases
... organisms) though
... show that such organisms
... opportunities of
... the extensive areas of raw and

the alveoli be
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The liver
clumps, mostl
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The spleen was
what species I cann
of two or three. A
distinctive to be foun

The kidney showed
nephritis, not very far a
some patches of recent
numerous, small, short, a
species they belonged.
amongst the tubules and gl
groups, in one case a clust
micrococci could be found in

Case VIII. George C., ag
firmary for synovitis of the kn
and died after eight weeks. This
I have examined sections of the

The skin was cut in paraffin
and the sections stained in genti

much the same appearances as in the two preceding cases, a slight excess of leucocytes in the corium, and in the Malpighian layer, the cells for the most part faintly stained. The stratum corneum was absent, and no micro-organisms could be detected in the sections, except one or two cocci on the surface.

The spleen sections showed engorgement with blood, and much pigment from broken-up blood corpuscles was present amongst the splenic cells. Here and there bacilli were scattered through the sections, but of what species I cannot say.

The kidney sections showed the changes of advanced interstitial nephritis. Numerous bacilli were present, evidently not all of the same species. They were most abundant at the edge of the sections, which suggests that they were intrusive putrefactive organisms. Some, however, were present here and there in the central parts of the sections, even inside blood vessels, but these were not numerous. One or two stray cocci and diplococci were observed.

It will be seen that, in part, owing to the difficulty of procuring suitable material, the conclusions that can be drawn from the preceding observations are not decisive.

As regards the histological changes in the affected skin, I have been able, thanks to the fortunate opportunity for excising a fragment from the living patient in the very earliest stages, to observe them at a much earlier period than I believe has been hitherto done. These changes appear to be most marked in the deepest layer of the epidermis, rather than in the true skin, and to consist in a dropsical condition of the epidermic cells, which are separated by an intercellular exudation. I could find no indication at this stage of the exudation of fluid and leucocytes between the derma and epidermis seen by Dr. Savill, though the lymph spaces of the corium were manifestly distended in places with serum. In the sections of older skin taken at post-mortem examinations eight to twelve weeks from the commencement of the disease, the ap[illegible]ere those of old inflammation, patches of brownish yellow pigme[illegible]ered through the corium and Malpighian layer, with an excess, not very marked, of leucocytes in the corium, and a tendency to proliferation of the deeper cells of the Malpighian layer such as might be expected to follow a protracted inflammation. The marked desquamative changes appeared to have their lower limit in the deepest cells of the stratum corneum, or in the stratum granulosum. In none of the cases examined at this late stage was there any indication of the casting off of any of the cells of the Malpighian layer, and in the very early case, desquamation had of course not commenced. I did not succeed in detecting any exudation of fluid between the derma and epidermis, whereby the latter was exfoliated, as seen by Dr Savill, but I cannot speak of the intermediate stages, which I have had no opportunity of investigating. I have been unable to recognise, as regards microscopical characters, any essential differences between the morbid histology of "epidemic" and ordinary eczema, in spite of the dissimilarity which they undoubtedly exhibit in their clinical characters.

With reference to the existence of a specific micro organism in the disease, it will be seen that my observations have so far yielded a negative result. If the malady is truly contagious it is eminently probably that the virus is a living organism. The fact that the onset is often localised and trivial, and is followed after a week or two by a generalised and symmetrical eruption, points to general infection of the blood in these cases. Yet the cultures made from the blood in my cases, as in most of those made by Dr. Risien Russell, have yielded no result,

organisms were found there. The most noteworthy changes were in the Malpighian layer of the epidermis, where the cells were more or less separated by exudation (with here and there indications of the extravasation of white and even red blood corpuscles) and appeared as very well marked "prickle-cells." These cells, especially the middle and upper layers, were swollen and dropsical, the nuclei staining badly, though the nucleoli were distinct. This change was more marked in some places than in others, and where it was most marked another change was also visible, namely, the appearance of irregular-shaped deeply-stained granules and rod-like bodies amongst and between the epithelial cells. At first sight the belief that these were micro-parasites of some kind was inevitable; they were sharply outlined, and deeply stained, especially in sections stained in gentian violet; but they were very irregular in form, some being spherical, some rod-shaped, some clubbed, and some branched, so that they lacked that uniformity which would have been expected in a given species of bacterium. For some time, however, I entertained hope that they might stand in some relation to the disease, until finally I discovered precisely identical appearances in the Malpighian layer of the skin in a case of human anthrax which had been cut and stained in the same way. I am unable to state their real nature with confidence, but I suspect that they are in part nerve-endings, and in part chromatin granules derived from the breaking-up of the nuclei; perhaps, also, they may be in greater part due to coagulation products of the exudation fluid between the cells. I have been thus unable to demonstrate the existence of any undoubted micro-organisms in the sections of skin from this apparently favourable case.

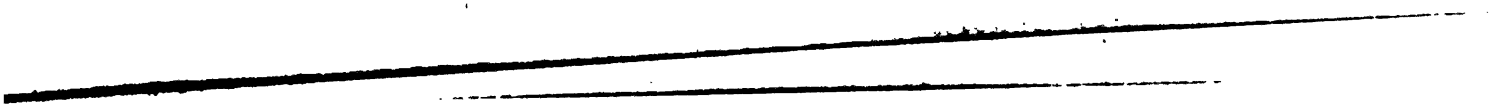
Further opportunities for studying the histology of the disease were available in some material from three fatal cases which was kindly put at Dr. Klein's disposal by Dr. Savill. These cases were amongst those described at length in Dr. Savill's paper read before the Medical Society of London in November 1891, and which appeared in the British Journal of Dermatalogy in 1892.

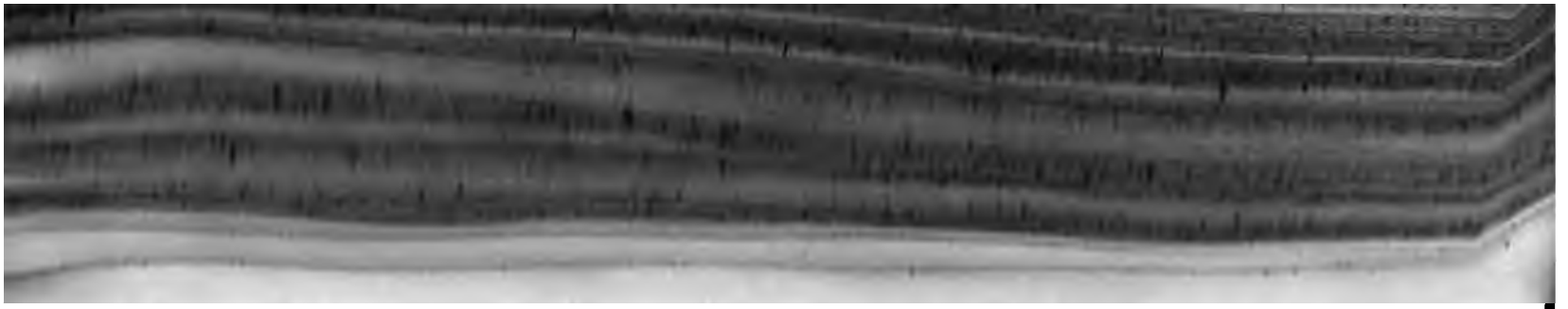
Case VI.—George H., aged 82 (Case M. XIV. of Dr. Savill's series), died in the Paddington Infirmary in 1891, six weeks from the commencement of the disease, which had been severe and general, attended by extreme prostration. I have examined sections of two pieces of skin, and of the liver and kidney from this case.

One piece of skin was apparently from the forearm or leg, the other from the palm. They were embedded in paraffin, and cut with a Cambridge rocking microtome (the sections being $\frac{1}{1000}$ in. in thickness) and stained in gentian violet.

The thinner piece of skin showed the stratum corneum almost entirely detached, the well-marked cells of the stratum granulosum forming the apparent free surface. The stratum corneum was doubtless loosened by the process of desquamation, and its detatchment accidental. The superficial layers of the Malpighian stratum were badly stained and showed numerous clumps of yellowish pigment; the cells were in places dropsical. The deep layer of the stratum Malpighii showed well-stained cells, not much separated by effusion; amongst them were numerous granules darkly stained, but irregular in size and shape, resembling the granules of the stratum granulosum, or the irregular fragments of chromatin in some of the nuclei. I could not recognise with certainty any micro-organisms in these sections. The corium showed practically no changes, except the presence of clumps of yellowish pigment.

The piece of skin from the palm showed very similar changes: the stratum corneum was, however, in large part present, and on its surface





ENAL GREEN INFIRMARY.

CASE XXV.

illiam A——, Aged 67.

rmary on the 27th March 1893. Suffering
3 12th May 1893 the eruption in an erythe-
ared on the elbows and rapidly extended over
ands, also, but in a slighter degree, over the
ood deal of thickening and induration of the
forearms, the large flat papules becoming

lid not suffer, but he was much troubled with
he skin; so severe at times as to prevent him
followed, leaving the skin of the arms tender.
se was about 10 weeks.

See Plate III.

PLATE IV.

CASE XIII.

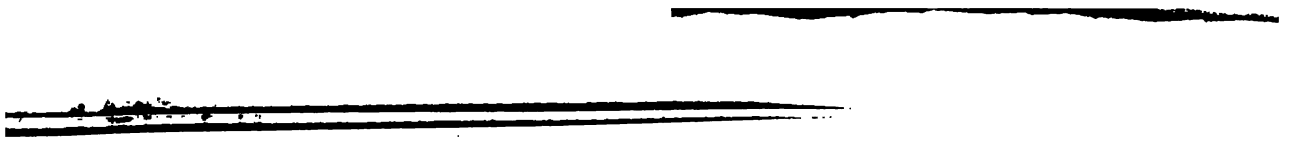
BETHNAL GREEN INFIRMARY.

CASE VI.

George I——, aged 76.

This patient was admitted into the Infirmary on the 23rd December 1892, suffering from hemiplegia. Eruption appeared in a papular form on the 4th May 1893, and first showed itself on the forearms, then on the thighs and legs, but soon developed into a general dermatitis, the skin becoming shining and œdematous. Patient suffered from loss of appetite, sickness, and diarrhœa for about two weeks before appearance of eruption. General desquamation followed, the epidermis of feet, hands, and legs separating in large flakes. There was great prostration and exhaustion throughout the course of the disease, and the patient died from asthenia, on the 9th June 1893.

See Plate V.



ADDENDUM B.

PARTICULARS as to CASES of EPIDEMIC SKIN DISEASE occurring in the [illegible] INFIRMARY.

No. of Ward in which Patient was when Eruption appeared.	Name of Patient.	Age	Date of Admission to Sick Ward.	Date of Appearance of Eruption.	Date of Removal to other Wards.	No. of Ward to which removed.	Diet of Patient at Time of Appearance of Eruption.	Amount of Milk which Patient was having when Eruption appeared.	Previous Malady from which Patient was suffering.	[illegible]
								Pints.		
2	C., John -	54	31.9.92	4.5.93	13.5.93	28	5, mutton broth, egg.	½	Bronchitis - -	Fair, up daily.
	C., Charles -	58	8.5.93	9.5.93	13.5.93	28	4, egg - -	2	None - -	In good health
	B., Henry -	82	24.3.92	10.5.93	13.5.93	28	5, fish, rice -	½	Senile decay -	In good health.
	L., Henry -	87	3.9.92	12.5.93	17.5.93	41	3, rice, egg -	½	Senile decay -	Confined to bed.
	B., Henry -	72	26.6.84	13.5.93	Not removed	-	3, rice, 2 eggs -	½	Rheumatic anthritis	Confined to bed
	H., William -	44	11.5.93	21.5.93	Not removed	-	4 - -	2	Injury to eye -	In good health.
	W., George -	70	24.9.90	30.5.93	30.5.93	27	3, rice - -	½	Ulcer of leg -	In good health.
5	J., John - -	69	15.5.93	12.5.93	23.5.93	38	3, pint milk -	1½	None - -	In good health
8	S., Sarah - -	80	14.3.92	20.5.93	Not removed	-	4 - -	2	Senile dementia -	Confined to bed.
	T., Jane - -	82	24.3.92	21.5.93	Not removed	-	4 - -	2	Senile dementia -	Confined to bed.
9	B., Elizabeth -	83	15.7.92	5.5.93	20.5.93	8	3 - -	½	Senile dementia -	In good health.
12	S., Harriet -	30	15.2.90	13.5.93	Not removed	-	5, fish - -	½	Epilepsy - -	In good health.
	M., Susan -	22	18.6.92	17.5.93	Not removed	-	3 - -	½	Epilepsy - -	In good health.
	E., Emma -	41	23.1.93	19.5.93	Not removed	-	3 - -	½	None - -	In good health.
	A., Amy - -	66	2.1.84	27.5.93	Not removed	-	3 - -	½	Epilepsy - -	In good health.
15	L., Mary Ann -	37	21.4.93	4.5.93	30.5.93	23	5, fish, pint milk	1½	Acute rheumatism	Convalescent, but
	S., Mary Ann -	47	24.5.93	24.5.93	30.5.93	23	3, pint milk, egg	1½	[illegible]	confined to bed.

[illegible] in kitchen till [illegible] to infirmary. [illegible] May 1893.

Workman, No. 5 Ward, sleeping in 4, front dormitory in "house" till 12th May 1893. At first left in 5 Ward. No other case in this ward.

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No. of Ward in which Patient was when Eruption appeared.	Name of Patient.	Age	Date of Admission to Sick Ward.	Date of Appearance of ruption.	Date of Removal to other Wards.	No. of Ward to which removed.	Diet of Patient at Time of Appearance of Eruption.	Amount of Milk which Patient was having when Eruption appeared.	Previous Malady from which Patient was suffering.	General Condition of Patient previous to Attack.	—
								Pints.			
	H., Elizabeth -	38	15.5.93	15.5.93	30.5.93	22	3, pint milk -	1½	None - -	In good health -	Admitted to house 5th August 1892. Attacked whilst acting as kitchen woman to Nurse 3, who has charge of 14, 15, 16, 17, 18, and 19 Wards. Sent to 15 Ward 24th May, and to 22 Ward 30th May 1893. Was discharged, recovered, to her home, 17th June 1893.
17	H., Elizabeth -	82	8.10.92	30.5.93	30.5.93	22	3 - - -	½	Hemiplegia - -	Feeble, confined to bed.	
	G., Mary - -	85	10.7.90	1.6.93	1.6.93	24	3, pint milk, egg	1½	Senile decay -	Confined to bed.	
18	F., Mary - -	58	21.1.93	6.5.93	30.5.93	22	5, chop, egg, pint milk.	1½	Lacerated elbow -	Health good, up daily.	
14 f.	D., Caroline -	73	13.6.92	10.5.93	30.5.93	22	3 - - -	½	Carcinoma of breast	Health fair, up daily.	
20 m.	D., George -	89	2.3.92	1.6.93	1.6.93	27	5, mutton broth	½	Senile decay - -	Health good, up daily.	
20 f.	A., Jane - -	43	16.8.92	12.5.93	17.5.93	22	4, egg - -	2	Aortic disease -	Confined to bed.	
	W., Sarah -	45	19.4.93	15.5.93	17.5.93	22	4 - - -	2	Sub-acute rheumatism.	Up daily.	
	S., Mary A. -	34	24.4.93	17.5.93	17.5.93	22	4 - -	2	Chronic bronchitis -	Up daily.	
21 f.	R., Elizabeth -	77	16.12.92	15.5.93	17.5.93	22	5, mutton broth, egg, pint milk.	1½	Bronchitis - -	Confined to bed.	
	W., Louisa -	52	8.3.92	30.5.93	30.5.93	22	5, beef tea -	½	Myxœdema - -	Health fair, up daily.	
21 a.f.	H., Charlotte -	84	13.10.92	14.5.93	30.5.93	24	4, 2 eggs -	-	Senile decay - -	Feeble, confined to bed.	Died 13th June 1893.
	B., Elizabeth -	73	17.12.92	22.5.93	30.5.93	24	5, fish, egg -	-	Bronchitis - -	Health fair, up daily.	
22 f.	H., Mary A. -	34	5.11.92	12.5.93	Not removed -		4, fish and beef tea, 2 eggs, pint milk.	3	Chronic bronchitis -	Health fair, up each day.	
	S., Ellen - -	36	2.11.92	14.5.93	Not removed -		4 - - -	2	Phthisis - -	Confined to bed.	
	P., Harriet -	52	20.5.93	14.5.93	Not removed -		5, mutton broth, pint milk.	1½	Ulcer of leg - -	In good health.	

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No. of Ward in which Patient was when Eruption appeared.	Name of Patient.	Age	Date of Admission to Sick Ward.	Date of Appearance of Eruption.	Date of Removal to other Wards.	No. of Ward to which removed.	Diet of Patient at Time of Appearance of Eruption.	Amount of Milk which Patient was having when Eruption appeared.	Previous Malady from which Patient was suffering.	General Condition of Patient previous to Attack.	—
								Pints.			
	H., Elizabeth -	38	15.5.93	15.5.93	30.5.93	22	3, pint milk -	1½	None - -	In good health -	Admitted to house 5th August 1892. Attacked whilst acting as kitchen woman to Nurse 3, who has charge of 14, 15, 16, 17, 18, and 19 Wards. Sent to 15 Ward 24th May, and to 22 Ward 30th May 1893. Was discharged, recovered, to her home, 17th June 1893.
17	H., Elizabeth -	82	8.10.92	30.5.93	30.5.93	22	3 - - -	½	Hemiplegia - -	Feeble, confined to bed.	
	G., Mary - -	85	10.7.90	1.6.93	1.6.93	24	3, pint milk, egg	1½	Senile decay -	Confined to bed.	
18	F., Mary - -	58	21.1.93	6.5.93	30.5.93	22	5, chop, egg, pint milk.	1½	Lacerated elbow -	Health good, up daily.	
14 f.	D., Caroline -	73	13.6.92	10.5.93	30.5.93	22	3 - - -	½	Carcinoma of breast	Health fair, up daily.	
20 m.	D., George -	89	2.3.92	1.6.93	1.6.93	27	5, mutton broth	½	Senile decay - -	Health good, up daily.	
20 f.	A., Jane - -	43	16.8.92	12.5.93	17.5.93	22	4, egg - -	2	Aortic disease -	Confined to bed.	
	W., Sarah -	45	19.4.93	15.5.93	17.5.93	22	4 - - -	2	Sub-acute rheumatism.	Up daily.	
	S., Mary A. -	34	24.4.93	17.5.93	17.5.93	22	4 - -	2	Chronic bronchitis -	Up daily.	
21 f.	R., Elizabeth -	77	16.12.92	15.5.93	17.5.93	22	5, mutton broth, egg, pint milk.	1½	Bronchitis - -	Confined to bed.	
	W., Louisa -	52	8.3.92	30.5.93	30.5.93	22	5, beef tea -	½	Myxœdema - -	Health fair, up daily.	
21 a.f.	H., Charlotte -	84	13.10.92	14.5.93	30.5.93	24	4, 2 eggs -	-	Senile decay -	Feeble, confined to bed.	Died 13th June 1893.
	B., Elizabeth -	73	17.12.92	22.5.93	30.5.93	24	5, fish, egg -	-	Bronchitis - -	Health fair, up daily.	
22 f.	H., Mary A. -	84	5.11.92	12.5.93	Not removed -		4, fish and beef tea, 2 eggs, pint milk.	3	Chronic bronchitis -	Health fair, up each day.	
	S., Ellen - -	36	2.11.92	14.5.93	Not removed -		4 - -	2	Phthisis - -	Confined to bed.	
	P., Harriet -	32	20.5.93	14.5.93	Not removed -		5, mutton broth, pint milk.	1½	Ulcer of leg - -	In good health.	

[illegible]

No. of Ward in which Patient was when Eruption appeared.	Name of Patient.	Age	Date of Admission to Sick Ward.	Date of Appearance of Eruption.	Date of Removal to other Wards.	No. of Ward to which removed.	Diet of Patient at Time of Appearance of Eruption.	Amount of Milk which Patient was having when Eruption appeared.	Previous Malady from which Patient was suffering.	General Condition of Patient previous to Attack.	—
								Pints.			
	A., Joseph -	82	24.5.92	16.5.93	Not removed	-	3 - - -	½	Old age - - -	Up daily, in fair health.	
39	G., Alfred -	58	15.2.93	25.5.93	26.5.93	38	5, fish - - -	½	Gout - - -	In good health.	
40	S., John - -	42	31.3.93	5.5.93	17.5.93	41	3, 2 pints milk -	2½	Ulcer - - -	In good health.	
	C., James -	68	25.4.92	21.5.93	Not removed	-	3 - - -	½	Ulcer of leg - -	In good health.	
	F., Augustus -	82	28.6.92	24.5.93	Not removed	-	3, pint milk, egg	1½	Old age, cystitis -	Confined to bed.	
41	B., William -	82	17.2.93	12.5.93	Not removed	-	5, mutton broth	½	Hemiplegia - -	Confined to bed, but health good.	
43	V., James -	82	8.10.90	5.5.93	30.5.93	27	3 - - -	½	Old age, hernia -	Health good, up daily.	
	S., Page - -	67	12.2.92	15.5.93	17.5.93	40	3, rice - -	½	Rheumatism -	Health good, up part of day.	
	W., James -	83	7.3.93	2.6.93	2.6.93	40	5, fish, egg -	½	Chronic bronchitis -	Confined to bed.	
"House."	L., Alfred -	43	23.5.93	5.5.93	25.5.93	38	3 - - -	1	None - -	In good health -	Admitted to workhouse 29th Oct. 1892. Working in large kitchen till 23rd May, when discovered by Medical Officer. Date of appearance fixed from own statement.
	H., Arthur -	24	30.5.93	- -	- -	40	3, egg, pint milk before discharge.	1	- - - -	- - -	Says he has been sleeping at Salvation Army shelter in Queen Street for past nine weeks. Eruption on body for past month; appeared first on chest.
	P., James -	66	3.6.93	- -	- -	40	Says living badly at home.	1½	Prolapsus ani -	In fair health -	Discharged from 28 Ward 5th May 1893; eruption appeared about a week afterwards. On readmission, on 3rd June, was still out on arms and chest.

JOHN KNOX.

Bethnal Green Infirmary.

Table showing the Number of Persons and of Cases of Epidemic Skin Disease at each of Certain Age Periods in the Infirmary during May and June 1893. (Calculated on Number of Patients in Infirmary on May 4th, 1893, date of Commencement of Epidemic.)

Age.	1-9.		10-19.		20-29.		30-39.		40-49.		50-59.		60-69.		70-79.		80-89.		Totals at all Ages.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Number of persons under treatment at each age -	7	6	6	9	15	19	18	15	39	21	34	22	62	39	40	40	23	38	244	218
Number of cases affected with the epidemic skin disease - - -	0	0	0	1	1	4	0	5	7	4	6	6	11	2	11	7	9	12	45	41
Ratio of cases of the disease to inmates of Infirmary at each age; per cent. - - -	0	0	0	11·11	6·66	21·05	0	33·33	17·94	19·04	17·64	27·27	17·74	5·12	27·50	14·28	39·13	31·57	18·44	18·80
Proportion attacked in both sexes combined; per cent. - - -	0 out of 13.		1 out of 15, =6·66 %.		5 out of 34, =14·70 %.		5 out of 33, =15·15 %.		11 out of 60, =18·33 %.		12 out of 56, =21·42 %.		13 out of 101, =12·87 %.		18 out of 89, =20·22 %.		21 out of 61, =34·42 %.		86 out of 462, =18·61 %.	

BETHNAL GREEN INFIRMARY.

NAMES of those ATTACKED in ORDER of APPEARANCE of ERUPTION.

1	A., William -	4.5.93	44	S., M. A. - -	17.5.93
2	P., William -	4.5.93	45	M., Susan - -	17.5.93
3	L., Mary Ann -	4.5.93	46	P., Henry -	17.5.93
4	C., Charlotte -	4.5.93	47	M., Frances -	18.5.93
5	C., John - -	4.5.93	48	G., Margaret -	18.5.93
6	L., George - -	4.5.93	49	D., John - -	19.5.93
7	F., James -	4.5.93	50	S., George -	19.5.93
8	S., John - -	5.5.93	51	B., Edward -	19.5.93
9	V., James - -	5.5.93	52	E., Emma - -	19.5.93
10	B., Elizabeth -	5.5.93	53	H., Isabel -	20.5.93
11	L., Alfred - -	5.5.93	54	S., Sarah - -	20.5.93
12	C., Hammond -	5.5.93	55	T., Jane - -	21.5.93
13	F., Mary - -	6.5.93	56	S., William -	21.5.93
14	H., Ann - -	7.5.93	57	W., Elizabeth -	21.5.93
15	P., Lucy - -	8.5.93	58	F., Louisa - -	21.5.93
16	H., John - -	8.5.93	59	G., Elizabeth -	21.5.93
17	C., Charles -	9.5.93	60	C., James -	21.5.93
18	S., Joseph - -	9.5.93	61	A., John - -	22.5.93
19	B., Henry -	10.5.93	62	B., Elizabeth -	22.5.93
20	D., Caroline -	10.5.93	63	E., M. A. - -	22.5.93
21	T., William -	11.5.93	64	M., M. A. - -	22.5.93
22	R., Henry - -	11.5.93	65	B., William -	22.5.93
23	J., John - -	12.5.93	66	W., Edward -	23.5.93
24	L., Henry -	12.5.93	67	F., Augustus -	24.5.93
25	A., William -	12 5.93	68	B., Mary Ann -	24.5.93
26	A., Jane - -	12.5.93	69	S., Martha -	24.5.93
27	W., George -	12.5.93	70	S., Mary - -	24.5.93
28	B., William - -	12.5.93	71	P., John - -	25.5.93
29	C., Robert -	12.5.93	72	G., Alfred -	25.5.93
30	H., Mary - -	12.5.93	73	M., Elizabeth -	27.5.93
31	M., Ellen - -	12.5.93	74	A., Mary - -	27.5.93
32	B., Henry -	13.5.93	75	B., James - -	27.5.93
33	S., Harriet - -	13.5.93	76	H., Elizabeth -	30.5.93
34	H., Charlotte -	14.5.93	77	S., Henry -	30.5.93
35	S., Ellen - -	14.5.93	78	W., Louisa -	30.5.93
36	P., Harriet - -	14.5.93	79	W., George -	30.5.93
37	H., Elizabeth -	15.5.93	80	G., Mary - -	1.6.93
38	O., James - -	15.5.93	81	D., George -	1.6.93
39	S., Page - -	15.5.93	82	H., Arthur -	—
40	W., Susan - -	15.5.93	83	H., Philip - -	2.6.93
41	R., Elizabeth -	15.5.93	84	W., James -	2.6.93
42	A., James -	16.5.93	85	F., James -	—
43	S., Elizabeth -	16.5.93	86	W., Charlotte -	10.6.93

BETHNAL GREEN WORKHOUSE.

TABLE showing the frequency with which various Parts of the Body were first affected.

Parts first attacked by Skin Disease.	Males.	Females.	Total.	Per cent.
Wrists and forearms - -	24	20	44	[illegible]
Upper arm - - - -	0	0	0	[illegible]
Face and scalp - - -	7	6	13	[illegible]
Feet and legs - - -	2	2	4	[illegible]
Thighs and groins - -	2	1	3	[illegible]
Hands - - - -	1	2	3	[illegible]
Back - - - -	0	0	0	[illegible]
Neck - - - -	6	6	12	[illegible]
Chest and abdomen - -	3	4	7	[illegible]
Ears - - - -	0	0	0	[illegible]
	45	41	86	[illegible]

BETHNAL GREEN WORKHOUSE INFIRMARY.

DIET of PATIENTS attacked with EPIDEMIC SKIN DISEASE.

	On the 24th April 1893.	On the 4th May 1893.	On the 4th June 1893.
Total number having meat daily - -	45	42	29
" " fish daily - -	15	18	24
" " mutton broth daily -	6	7	14
" " beef tea daily - -	15	16	14
" " eggs alone - -	0	0	1
" " scalded milk alone daily	9	12	5
" " scalded milk and cold daily - - -	16	14	1
" " cold milk daily - -	72	71	77
" " extra milk daily -	28	26	12
" " milk daily - -	91	93	82
" " eggs, in addition to meat, daily - - -	12	11	10
" " eggs, in addition to fish, daily - - -	11	10	20
" " eggs, in addition to mutton broth, daily -	3	4	7
" " eggs, in addition to beef tea, daily - -	6	9	10
" " eggs daily - -	32	34	47
" " rice daily - -	27	27	21
Total number suffering from disease - -	81	83	82
	Males.	Females.	Total.
Total number attacked by said disease -	45	41	86

—	Males.	Females.	Total
Total number of sick inmates on 24th April 1893	252	230	482
Number admitted from 24th April till 10th June 1893 inclusive - - - -	202	152	354
	454	382	836

Bethnal Green Workhouse.

Number of Inmates in Workhouse and Infirmary and the Diets of the Patients in the Infirmary.

—	On the 24th April 1893.	On the 4th May 1893.	On the 4th June 1893.
Total number of inmates in workhouse -	1,321	1,326	1,304
" " sick in infirmary - -	482	462	454
" " " having meat daily -	255	249	214
" " " fish daily - -	92	85	92
" " " mutton broth daily -	42	46	51
" " " beef tea daily -	90	79	92
" " " eggs alone daily -	3	3	5
" " " scalded milk only daily - -	47	55	49
" " " scalded milk and cold milk - -	88	88	58
" " " cold milk daily -	435	429	399
" " " extra milk daily, cold	159	154	36
" " " milk daily - -	482	462	454
" " " eggs, in addition to meat, daily -	75	70	49
" " " eggs, in addition to fish, daily - -	55	46	58
" " " eggs, in addition to mutton broth, daily	26	35	27
" " " eggs, in addition to beef tea, daily -	43	38	48
" " " eggs, daily - -	202	192	187
" " " rice daily - -	170	158	123

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" " " eggs, daily - -	202	192	187
" " " rice daily - -	170	158	123

Dietary Table of the Bethnal Green Workhouse.

Able-bodied.	Breakfast.		Dinner.					Supper.			
	Bread.	Oatmeal Gruel.	Cooked Meat.	Potatoes or other Vegetables.	Bread.	Pea Soup.	Suet Pudding.	Bread.	Broth.	Cheese.	Tea.
	Ozs.	Pints.	Ozs.	Ozs.	Ozs.	Pints.	Ozs.	Ozs.	Pints.	Ozs.	Pints.
Sunday - Men	6	1½	5	8	—	—	—	6	1½	—	—
Sunday - Women	5	1½	5	8	—	—	—	5	1½	—	—
Monday - Men	6	1½	—	—	—	—	14	6	—	2	1
Monday - Women	5	1½	—	—	—	—	12	5	—	2	1
Tuesday - Men	6	1½	5	8	—	—	—	6	1½	—	—
Tuesday - Women	5	1½	5	8	—	—	—	5	1½	—	—
Wednesday - Men	6	1½	—	—	4	1½	—	6	—	2	1
Wednesday - Women	5	1½	—	—	4	1½	—	5	—	2	1
Thursday - Men	6	1½	5	8	—	—	—	6	1½	—	—
Thursday - Women	5	1½	5	8	—	—	—	5	1½	—	—
Friday - Men	6	1½	—	—	—	—	14	6	—	2	1
Friday - Women	5	1½	—	—	—	—	12	5	—	2	1
Saturday - Men	6	1½	—	—	4	1½	—	6	—	2	1
Saturday - Women	5	1½	—	—	4	1½	—	5	—	2	1

Aged and Infirm.		Breakfast.			Dinner.					Supper.		
		Bread.	Butter.	Tea sweetened with half an ounce of Sugar to each Pint.	Cooked Meat.	Potatoes or other Vegetables.	Bread.	Pea Soup.	Suet Pudding.	Bread.	Butter.	Tea sweetened with half an ounce of Sugar to each Pint.
		Ozs.	Oz.	Pint.	Ozs.	Ozs.	Ozs.	Pint.	Ozs.	Ozs.	Oz.	Pint.
Sunday	Men	6		1	5	8	—	—	—	6		1
	Women	5		1	5	8	—	—	—	5		1
Monday	Men	6		1	—	—	—	—	14	6		1
	Women	5		1	—	—	—	—	12	5		1
Tuesday	Men	6		1	5	8	—	—	—	6		1
	Women	5		1	5	8	—	—	—	5		1
Wednesday	Men	6		1	—	—	4	1½	—	6		1
	Women	5		1	—	—	4	1½	—	5		1
Thursday	Men	6		1	5	8	—	—	—	6		1
	Women	5		1	5	8	—	—	—	5		1
Friday	Men	6		1	—	—	—	—	14	6		1
	Women	5		1	—	—	—	—	12	5		1
Saturday	Men	6		1	—	—	4	1½	—	6		1
	Women	5		1	—	—	4	1½	—	5		1

No. 1	House diet, being the ordinary diet for paupers in the house.

No. 2.		Breakfast.			Dinner.						Supper.				
		Bread.	Tea.	Butter.	Cooked Meat, without Bone.		Potatoes or Bread.		Milk, not ordinarily boiled, except in hot Weather.		Bread.	Tea.	Butter.	Milk.	
2	Full diet - - -	Ozs.	Pts.	Oz.	Ozs.	Pts.	Ozs.	Ozs.	Pts.		Ozs.	Pts.	Oz.		
2	Males - - -	6	1	½	5		8	6	1	Cold.	6	1	½		
2	Females - - -	5	1	½	5		8	5	1		5	1	½		

No. 3.		Breakfast.			Dinner.					Supper.				
		Bread.	Tea.	Butter.	Cooked Meat, without Bone.		Potatoes or Bread.		Milk.		Bread.	Tea.	Butter.		
	Rice and milk frequently; this diet at 11 a.m.	Ozs.	Pts. 1 pint of milk to 1 gallon of tea.	Oz.	Ozs.		Ozs.	Ozs.	Pt.		Ozs.	Pts.	Oz.		
3	Males - - -	5		½	5		8	6	½	Cold always.	5	1	½		
3	Females - - -	4	1	½	5		8	5	½		4	1	½		

* If thought proper by the medical officer, an additional number of dietaries may be introduced, and numbered consecutively.

No. 4.		Breakfast.					Dinner.									Supper.				
4	Fever diet -	Bread.	Milk, Hot.	Butter.	Tea.			Beef Tea.	Bread.	Rice with Milk.						Bread.	Milk, Hot.	Sago.	Butter.	Tea.
		Ozs.	Pts.	Oz.	Pts.		Ozs.	Pts.	Ozs.	Ozs.						Ozs.	Pts.	Pts.	Ozs	Pts.
4	Males -	3	1					1	3	8						3	1			
4	Females -	3	1					1	3	8						3	1			
5	Males -	5		½	1						½	No. 5 Diet. The dinners are ordered by the medical officers.				5			½	1
5	Females -	4		½	1						½	With fish or chop, 8 ozs. potatoes or bread. Fish with 4 and 5 diets. With beef tea, 5 ozs. bread for males and 4 ozs. for females. With mutton broth, 5 ozs. bread for male and 4 ozs. for females. With eggs, 5 ozs. bread for males and 4 ozs. for females, and ½ oz. butter each.					4			½	1

N.B.—Sugar, arrowroot, sago, butter, milk, wine, spirits, porter, and beer are in all cases to be treated as extras [illegible] is to be then specified in the proper column of this book.

Infirmary. City of London Union.

Sick Dietaries.

—	—	Breakfast, 7 a.m.	Dinner, 12 p.m.	Supper, 5 p.m.
No. 1. Ordinary diet	Men and women - -	5 oz. bread and butter, 1 pint tea.	Sunday, Tuesday, Wednesday, Thursday, and Saturday. 5 oz. cooked meat. 8 oz. potatoes or vegetables. Monday and Friday. 1 pint soup. 4 oz. bread.	5 oz. bread and butter. 1 pint tea.
No. 2. Full diet -	Men and women - -	4 oz. bread and butter. 1 pint tea.	5 oz. cooked mutton. 8 oz. potatoes or vegetables.	5 oz. bread and butter. 1 pint tea.
No. 3. Low diet -	Men and women - -	4 oz. bread and butter. 1 pint tea.	4 oz. cooked mutton or ½ pint broth or beef tea. 4 oz. bread.	4 oz. bread and butter. 1 pint tea.
No. 4. Milk diet -	Men and women - -	2 oz. bread and butter. ½ pint milk stewed.	12 oz. rice pudding. 2 oz. bread - -	2 oz. bread and butter. ½ pint milk stewed.

Children under 3 years of age, 4 diet; above 3 years of age, 3 diet.

Note.—All articles of diet not mentioned in the dietary, as also stimulants, fruit, and other extras, are to be ordered by the medical officer when required, and the quantities so ordered are to be entered in the medical relief book.

The meat to be baked or minced when ordered. Beef, meat pie, or bacon, to be substituted for mutton, at the discretion of the medical officer.

Quantities used in each pint of articles named in the dietary.

Soup: 3 oz. peas or rice, 6 oz. meat and bone in the liquor in which meat has been boiled. Beef tea: 8 oz. meat, without bone, to each pint. Broth: 8 oz. meat to each pint, the meal to be served with the broth. Rice pudding: 2 oz. rice, ½ oz. sugar, 1 egg, ½ pint milk. Gruel: 4 oz. oatmeal, 2 oz. milk to each pint. Tea: ¼ oz. tea, ½ oz. sugar, 2 oz. milk to each pint. Cocoa: ½ oz. cocoa, ½ oz. sugar, 2 oz. milk, to each pint.

C. H. Buncombe, Medical Officer,
25th March 1893.

This form approved, 14th February 1893.
F. W. Crane, Clerk.
Order No. 107

App. A. No. 11.
On an Outbreak of Epidemic Skin Disease; by Dr. Copeman.

App. A. No. II.

On an Outbreak of Epidemic Skin Disease; by Dr. Copeman.

II.—INFIRMARY OF ST. LEONARD'S, SHOREDITC

While my report on the outbreak of epidemic skin disease at
Green Infirmary was passing through the press, I learnt, throu
Downes, that two or three cases of what appeared to be th
affection had recently come under treatment at the Infirmary
Leonard's Workhouse, Shoreditch.

Accordingly, early in May 1894, I visited the Infirmary
purposes of investigating the local circumstances of the outbreak
Medical Superintendent (Mr. Forbes) informed me that the dise
first been noticed in the case of a patient named William W-
59 years of age, who stated that he had had a similar attack 11
prior to admission. There were, at the date of my visit, I was inf
10 cases of an apparently similar nature under treatment. On
round the wards with Mr. Forbes we found that the number of
was somewhat larger than had been anticipated; in a few ins
the disease had, apparently, from its comparatively mild character
overlooked, and the patients themselves had made no special compl

On several subsequent occasions also, I visited the Shore
Infirmary, and have thus seen nearly all the cases that have occurr
to the time of writing. On two of these occasions Dr. And
secured a number of samples of blood, exudation, &c., for bacteriol
examination; but, unfortunately, up to the present the results ob
by him have been practically negative.

There cannot, however, be any doubt that these cases of skin
at the Shoreditch Infirmary are identical in nature with those wi
previously investigated at the Bethnal Green Infirmary. Wit
object of substantiating this statement, I append, in brief, the c
histories of five of the Shoreditch cases. These histories Mr. Forbe
been good enough to copy for me from the Infirmary records.

At Shoreditch, as was witnessed in the previous outbreaks at Bet
Green, Paddington and Marylebone, the incidence of the disease
been limited almost entirely to the Infirmary. Here there have b
thus far, 51 cases with five deaths, out of a total at the time tha
disease commenced of 149 patients; while only five cases have oc
in the Workhouse, which immediately adjoins the Infirmary.

Moreover, as in former instances, the disease has for the mos
singled out persons over middle age who were debilitated by pre
chronic illness of one kind or another. The sex incidence of attac
shown no great disparity; 23 males and 28 females having been atta
of whom four males and one female have died. The total num
patients on the books of the Infirmary on March 31st, 1894, was 4
whom 227 were males and 222 females (including infants).

On the same date the inmates of the Workhouse numbered 794
males and 423 female (including infants).

On making inquiry as to the possible exciting cause or causes
epidemic at Shoreditch Infirmary, I found a belief prevalent that
in some way or other been brought about through the water s
which is peculiar to the institution.

Previously to June 1893 both Workhouse and Infirmary were su
with water from the mains of the New River Water Company, t
they obtained, in addition, a comparatively small quantity from
on the premises. In February 1893 this well was deepened by
to the extent of 100 feet, sufficient water being thus obtained

find a place in the Infirmary dietary; milk is also supposed to be of quality in both cases, the total amount supplied at any one time b divided between the two portions of the institution, of which the I mary obtains by far the larger share. Indeed, milk is practic excluded from the Workhouse dietaries, except such small quantity supplied in tea and puddings.

Tabulation of the inmates of the Infirmary attacked by epidemic disease according to the various food-stuffs comprised in their dietar the time of invasion, shows that of the 50 patients (one patient came in with the disease is not included in this number) attacked in Infirmary during the course of the epidemic—

25, or	50	per cent.,	were	on a	diet containing	meat daily.
2, or	4	"	"	"	"	eggs daily.
13, or	26	"	"	"	"	beef tea daily.
23, or	46	"	"	"	"	mutton broth daily.
4, or	8	"	"	"	"	fish daily.
50, or	100	"	"	"	"	milk daily.

As was found to be the case in the earlier epidemics at the Beth Green and City of London Infirmaries, so here it will be seen that the various articles of diet supplied to patients in the Infirmary, mi was the only one which had been taken in common by all those attacke by the disease. At the same time it is not supposed to be supplied inmates of the Workhouse. Five cases of the disease, howev occurred in the House, but, as will be seen later in this report, there reason for believing that all these persons had obtained and consum varying quantities of milk.

On account of these facts, and of my previous experience at oth infirmaries, I made special inquiry as to the *source* and *quality* of t milk supply. In view of the results of my investigations at t Bethnal Green and City of London Infirmaries, it appeared not a lit interesting to learn that the same milk contractors, Messrs. A., Homerton, had also been supplying the Shoreditch Workhouse an Infirmary for some two years past. The amount of such supply, learnt, had averaged 37 barn gallons per diem for the fortnight previou to my first visit. The Clerk informed me that the contract price t the Shoreditch Guardians is at present 1*s.* 8¾*d.* per barn gallon (7¾ per barn gallon above the contract price of milk supplied by the contractors to Bethnal Green). The terms of the contract are, I foun as follows:—"Genuine new unskimmed milk, pure and unadulterate "to register not less than 8 per centum of cream after standing for 3 "hours in an ordinary lactometer to be provided by the Guardians."*

The per-centage of cream is estimated by the storekeeper, usual twice daily, and an account is kept, which I had the opportunity examining. The storekeeper informed me that the quality of the mi supplied by Messrs. A. had not been good for a considerable peri and had become suddenly worse about the middle of February last.

Having from my previous investigations into outbreaks of the epide skin disease in question, found reason to believe that the incubati period of the disease up to the date of appearance of the eruption usually about a fortnight, I paid special attention to the storekeep record of quality of the milk, as regards specific gravity and amount cream, during the week but one previous to the outbreak of the f case in the Infirmary. Such record for March 12th, 1894 (a fortni

* Sidney Martin gives the cream of full-cream milk as 10–15 vols. per cent., of half-creamed milk as 5–6 vols.—Text Book of Hygiene, vol. I, p. 435.

previous to appearance of eruption in the first case), and for the two previous and two following days, I give below. From this it will be seen that on March 12th the amount of cream was less than half that required by the terms of the contract.

TABLE showing SPECIFIC GRAVITY and PER-CENTAGE of CREAM in MILK supplied to the SHOREDITCH WORKHOUSE and INFIRMARY.

		Sp. gr.	Per-centage of Cream.
March 10th, 1894	M.	1,033	5 per centum.
	A.	—	4 „ „
„ 11th „	M.	1,033	5 „ „
	A.	—	—
„ 12th „	M.	1,031	3 per centum.
	A.	—	—
„ 13th „	M.	1,031	5 per centum.
	A.	—	6 „ „
„ 14th „	M.	1,033	8 „ „
	A.	—	5 „ „

From previous acquaintance with the method in which Messrs. A.'s business was conducted it was obvious that it would be impossible to trace the actual source of the milk which had been supplied to the institution on any particular day or days; the names of different farmers borne on the labels of the various milk cans affording no guarantee that the contractors were even dealing at all with such a man. For these reasons it was quite hopeless to undertake search for any possible source of contamination of the milk, human or other, assuming that there was ground for suspicion that the milk bore some causal relationship to the disease in question.

That some such causal relationship did actually exist it is impossible to deny; and such a hypothesis is, I think, not inconsistent with the observed facts of the case.

Reference to the Infirmary diet table shows indeed that milk, as such, is to be given only in connexion with diets Nos. 4 (low) and 7 (children). But it enters, in small amount, into all other dietaries, along with the tea consumed at breakfast and supper. As a matter of fact, however, practically all patients in the Infirmary, as I was informed by the Medical Superintendent, receive an extra half pint, at least, of milk daily. In the Workhouse, on the other hand, no milk is supposed to be given, except such as is contained in tea.

It will be seen from the appended lists of cases of the skin disease that all with the exception of five occurred in the Infirmary, and it was not until the malady had attained fairly considerable dimensions that the first case in the Workhouse was observed.

On being informed of the occurrence of this case (Charlotte C——, æt. 62), I asked whether she had been in receipt of an allowance of milk and was told by the Medical Officer that such was *not* the case, the patient being on infirm diet only. This being so it appeared not unlikely that some new light might be thrown on the etiology of the disease by investigation into the special circumstances of the case. As a result of such further inquiry, however, it appeared that this woman had been employed since January 28th, 1893, in the Matron's Stores, and in consideration of such extra work had been allowed a quart of

milk daily. Two other women named H—— and E—— had, I found, been employed in the Matron's Stores for a longer period than C—— but neither of these had received such extra allowance of milk. Neither of these women, up to the present, has contracted the disease. As far as could be learnt C—— had never visited the Infirmary, but being over 60 years of age, she could go out of the house for a short period once every fortnight.

The other Workhouse cases (Nellie C——, æt. 22; Priscilla C—— æt. 49, Sophia G——, æt. 64; and Henry S——, æt. 65) either occurred or were first noticed later on in the course of the epidemic. As far as is at present known these four patients had not been having, previous to their illness, any milk beyond that given in the tea. In view, however, of the definite statement to this effect made to me in the first instance with regard to the woman C——, it is somewhat doubtful whether such statement in reference to these cases can be implicitly relied on. I have since learnt that one of these women had been receiving an allowance of from one to two pints of milk daily, and that it is probable that all the other cases had obtained varying quantities of milk although they had no definite allowance.

All the patients attacked in the Infirmary had previously been taking a greater or less quantity of milk daily, and with the exception of milk I was quite unable to find any article of diet which was common to all the persons in the Infirmary who suffered from the malady in question.

Neither could I discover, in the surroundings of the inmates of the Workhouse and Infirmary, any circumstance which was peculiar to those attacked with the disease, or even to those parts of the Institution in which cases had occurred.

S. MONCKTON COPEMAN.

August 1894.

ADDENDUM A.

Shoredith Infirmary.

Clinical History of Cases of Epidemic Skin Disease.

Case I.

John H——, aged 73, admitted on the 16th January 1894, suffering from bronchitis, was on diet 3 (meat and potatoes) with half a pint of milk for seven weeks before eruption, always had half a pint of milk daily since his admission. Bronchitis treated by simple expectorant mixture.

April 9th.—Numerous small red pimples on chest; general condition normal; skin, itchy.

April 10th.—Spots extended down arms.

April 11th.—Spots all over body, arms, and legs.

Pimples now gradually coalesced so as to form a uniform redness; eye watering; eyelids, œdematous; conjunctivæ injected; some discharge from ears. Temperature was up to 100 (about) every evening, and normal in the morning. On the 13th it rose to 103 at 6 p.m., but after that gradually fell to normal, and since the 19th of April has only been a couple of times above normal, and even then never above 100. His general health was quite as good as ever, the irritation made him restless, but his appetite was as usual. The urine occasionally contained albumen. Testicles were swollen.

April 26th.—Desquamation set in all over body. On the hands and feet of this patient the desquamation was remarkably coarse; the epidermis of several of the fingers came off whole, leaving behind a tender red skin.

At present patient is subject to occasional relapses.

Case II.

George S——, aged 60, admitted on the 28th December 1893, suffering from hæmoptysis. At time of eruption diet was No. 4 (milk diet) with half a pint of beef tea and half a pint of milk; was on that for 2½ months before eruption, having been always on milk since his admission.

Eruption began on the 17th April 1894, as red patches on the backs of the fingers close to the nails. These patches were not itchy, they gradually spread up the arms and over the body and legs. In between the patches a number of small minute papules appeared, and according to the patient these spots were extremely itchy. The face now became swollen and "lumpy," eyelids œdematous; œdema was also present over the body. Temperature was mostly above normal, but never higher than 101·3°.

Albumen was always present in urine.

Patient's condition, which was by no means good before the attack, suffering as he was from phthisis, now became worse. On the 3rd May, patient noticed "lumps" in his axilla. Glands were found acutely inflamed, gradually went on until abscess formed, which was opened and pus drained off. Patient's ankles, knees, and elbows became much swollen. General condition getting worse. Testicles swollen. Abscesses formed near the joints and over various parts of the body. Much of the eruption in a pustular condition.

May 19th.—Patient gradually sinking.

From this date until the 25th, when patient died, the eruption seemed gradually to become cleaner and less pustular.

P.M.—Done on the 28th May 1894. Body generally was very dropsical; there was no appearance of the skin affection from which patient was suffering when he died except a little about the eyes and soles of the feet.

Heart.—Marked pericardial adhesions; valves, atheromatous; left ventricle hypertrophied.

Lungs.—Both apices contained cavities with some surrounding consolidation, fluid and adhesions present in both pleural cavities, more fluid on the left side and more adhesions on the right. Liver, spleen, intestines, and kidneys congested. Number of small whitish elevations noticed on the anterior border of liver.

Case III.

Sarah V——, aged 65, sent into Infirmary on the of 5th May 1884 suffering from sclerosis of nerve centres; also had heart disease.

Rash appeared on 20th June 1894. Patient then on milk diet and taking medicinally Mist. Hydrarg. cum Pot. Iod.

General condition of patient was poor at time of eruption. At onset no nausea or vomiting, patient said she "felt much the same as usual," took her nourishment well, complained of itchiness and feeling of heat in the feet; temperature subnormal in morning, 99·4° at night. The rash for first three days was limited to dorsum and sole of foot; it first appeared as minute scattered bright red papules; these gradually became more numerous, skin much swollen, not tender; papules became clustered together in patches.

On the 26th rash was spreading, and had got above ankle, still kept its brilliant colour. On 27th it was as far up as knees, and the right leg was somewhat worse than the left. During these days patient's general condition continued the same as usual, always said she felt well, and had no nausea.

Once up to the knees the rash seems suddenly to have extended all over the body, on which it presented much the same characteristics as it had on the legs; occasionally over the body and limbs now one noticed some "crusts" as if there had been some "weeping" (as in eczema), but a minute examination did not reveal any vesicular tendency.

On 30th, face very flushed appearance. Not taking food so well for first time. Lies curled up in bed, and does not wish to be disturbed.

Temperature 100° at night (highest during whole period of rash). Œd of legs is very marked.

On 4th July eruption all over body becoming much duller in col and now scaly, desquamation is present. Desquamation not *fine*, bu large pieces. Thick horny skin over palms of hands and soles of coming off.

14th July.—Desquamating very freely. General condition good.

20th July.—Body and limbs clear of desquamation. Still remain hands and feet.

During this time occasionally there was a trace of albumen in u No sugar. Bowels tendency to constipation, and laxitives were fr given.

25th July.—Patient not so well. Temperature and pulse normal. R has reappeared on feet. Has the same characteristics as previou Œdema well marked. No albuminuria.

1st August.—Rash did not spread beyond knees. General condi worse than at any previous time of illness. Rash subsiding. Orde some stimulant for first time.

16th.—Œdema and rash gone, except for some staining left by t latter. Improving in herself well. Takes fluid nourishment well.

Case IV.

Robert P——, aged 56, admitted on the 10th May 1894, suffering fr an inflamed leg. Was at once put on diet 3 (meat and potatoes), and hal pint of beef-tea; no milk. Medicinally he took some iron, and lead-a opium lotion was the application to leg.

June 16th.—Small pimply rash on face (first), arms and legs itchi lichenous in appearance; occasionally it is in patches, which are compos of numerous pimples or papules clustered together. No nausea vomiting; tongue, clean; feels as well as usual. Temperature, norm Pulse, 68.

June 18th.—Face, swollen; eyelids, œdematous bags; rash thicker, bri colour, vesicular here and there; tendency to "weep." Temperatu normal; urine, no albumen; taking nourishment well.

June 21st.—Face very puffy; rash spreading intensely all over bo where it presents the same characteristics as it did on appearing on fa and legs. Yellow crusts on face, and a couple of small crusts on le Temperature is gradually rising to-day: normal in the morning, gone to 100° at night. Patient "off his food"; not so well.

June 22nd.—Temperature gone up to 101·4° this morning. Patient h had several rigors; urine febrile, no albumen. Pulse 84. Good deal exudation on face, but the rest of body is free; exudation seems to stiff linen; eyelids very "baggy," and has conjunctivitis of both eyes. Patie put on large doses of quinine and iron with digitalis.

On the 23rd much better. Œdema of face less; rash over body see to have sunk into a simple general deep-red injection of the ski resembling the rash of scarlatina, but with a more mottled appearan Still has one or two yellow crusts. Temperature, 99°; has some balanit

25th July.—Body and limbs desquamating freely in flakes: has itchiness now. Urine, no albumen. Temperature, normal.

After above date desquamation continued four weeks; temperatu would occasionally rise and patient would not feel so well, and accompanyi the rise would generally be found a slight recurrence of the affecti which, however, as in the case of almost all the relapses, yielded at once treatment. At present (20/8/94) patient is still desquamating slightly, s has relapses, and although he has had a rather severe attack his gene condition is good.

Case V.

John C——, aged 49, admitted on May 23rd suffering from gout. Di with half a pint of milk. Had that from admittance until erupti appeared.

Patient was on guiacum mixture for sometime before rash came out on the 11th of July 1894.

The scrotum was the first part affected, caused intense irritation, and on examination the skin seemed inflamed and moist; pimples or papules could not be seen. General condition remained the same as formerly; no vomiting or nausea; no diarrhœa; tongue, normal; urine, normal.

13th July.—The thin cuticle over the scrotum has peeled off, leaving a moist red surface, very tender; no testicular swelling. Temperature, normal. Patient feels well. Over the body there is present a lichenous pimply eruption, very thick and itching.

17th July.—Eruption on body remains the same; scrotum the only place that there has been any attempt at "weeping." General condition, same.

19th.—Desquamation in this case "fine" over all the body.

21st.—Relapse of rash on body, which was followed speedily by desquamation.

ADDENDUM B.

Shoreditch Infirmary.

Table showing part of the Body on which the Eruption first appeared.

Part first affected.	No. of Male Cases.	No. of Female Cases.	Total Cases.	Per-centage.
Arm and Forearm	14	13	27	50·9 per cent.
Face and scalp	3	4	7	13·2 „ „
Feet and legs	3	3	6	11·3 „ „
Hands	1	3	4	7·5 „ „
Back	—	—	—	—
Neck	—	3	3	5·6 „ „
Chest and abdomen	1	2	3	5·6 „ „
Ears	—	—	—	—
Thigh and groins	1	1	2	3·7 „ „
Scrotum	1	—	1	1·8 „ „
Total	24	29	53	

ADDENDUM C.

Letter from the Clerk to the Guardians of the Poor of the Parish of St. Leonard, Shoreditch, London.

Clerk's Office,
213, Kingsland Road, N.E.,
7th May 1894.

My Dear Sir,

You probably know that frequent complaints have been made of the quality of our milk supply with respect to the per-centage of cream, and samples have been taken and analysed by the Sanitary Authority. To furnish you with a complete history of the proceedings would be a lengthy affair and is probably unnecessary. There was no evidence to justify a prosecution under the Adulteration Acts, and the Guardians were not inclined to commence an action for breach of contract. They propose to reserve to themselves further power under the next contract they enter into. The analysts' report did not give the constituent parts, but stated merely that there was as to three samples, three per cent. of water beyond the "normal," and as to another sample, that it was "of low quality."

With regard to the water, I am not aware that any analysis was undertaken *before* deepening the well. The work was undertaken with a view to increasing the supply, and not from any misgiving as to the purity of

the water. After the deepening was completed, and before we commenc to use the water in October last, the Guardians received the analys report, of which I send herewith a copy.

I am, &c.
ROBERT CLAY,
Clerk.

Dr. Copeman,
Local Government Board,
Whitehall, S.W.

COPY of ANALYSIS by H. R. GREGORY, F.I.C., of a SAMPLE of WATER from the WELL at the WORKHOUSE of ST. LEONARD'S, SHOREDITCH.

7, Quality Court,
Chancery Lane, London, S.W.,
27th June 1893.

Sample of well water contained in two Winchester quarts marked—"Sample of water taken from well in Shoreditch Workhouse, after 2 "hours' continuous pumping, on June 22nd, 1893, at 10.45 a.m., i "presence of Engineer.—R. Larcombe, Master," received on the 23r inst. was analysed, with the following results:—

Total solids per gallon (did not blacken when heated.)	43·05 grains.
Saline ammonia per million	0·20 ,,
Albuminoid or Organic ammonia ,,	0·01 ,,
Nitrogen or nitrates per gallon	None.
Chlorine or chlorides ,,	5·53 ,,
Oxygen absorbed from permanganate in 4 hours	0·0189 ,,
Colour in two-foot tube nearly colourless, very pale blue.	

The sample contained a slight trace of suspended matter, which, whe collected, was found to consist of sand and carbonate of lime.

Degrees of hardness	4·2 grains.
,, after boiling	3·2 ,,

The total solids were composed as follows:—

Silica	0·71 grains.
Oxide of iron	trace
Carbonate of lime	3·22 ,,
Carbonate of magnesia	2·96 ,,
Chloride of sodium	9·11 ,,
Sulphate of soda	19·19 ,,
Carbonate of soda	6·60 ,,
Combined water, trace of organic matter	1·26 ,,
	43·05 grains.

From the foregoing results it will be seen that this is an extremely pure and soft water, entirely free from organic impurity derived from animal source, and is, therefore, well-fitted for general domestic use and consumption.

(Signed) H. R. GREGORY, F.I.C.

REPORT by PROF. CROOKSHANK, M.B., on SAMPLES of WATER and MIL submitted to him by the GUARDIANS OF ST. LEONARD'S, SHOREDITCH.

Bacteriological Laboratory, King's College,
London, 6th August 1894.

SIR,

I BEG to report the results of the bacteriological analysis of th samples of water and milk, in accordance with your instructions from th Guardians of the Poor of the Parish of St. Leonard's, Shoreditch.

I need not describe all the technical details of the processes to which the samples were subjected, but I will briefly give the results.

Sample A. was a sample of hot water taken from the kitchen, June 25th, at 9 a.m. It was received at King's College at 2.30, and examined the same afternoon. This remark applies to the other samples as well.

It was found to contain about 60 micro-organisms per cubic centimetre, and was, therefore, bacteriologically very good.

Sample B., a sample of cold water, taken at 9 a.m. from the tap within the sink on the same day, was exceptionally pure. There were practically speaking, no micro-organisms present, a result so unusual in the case of tap-water, that the examination was again repeated with the utmost care, but the same results followed. This excessive purity of tap-water is so unusual, that I am tempted to suggest that the samples may have been by some chance wrongly labelled. This, however, is only a matter of scientific interest, both samples must be pronounced as bacteriologically pure. And no micro-organism was isolated which could, in my opinion, in any way account for the outbreak of skin disease in the Infirmary.

I will now pass on to refer to the samples of milk.

Sample C. was from milk supplied by the contractor at 7 a.m., June 25th, and labelled No. 1, Westerdale, Melton Mowbray Churn, No. 786A. This sample contained about 500,000 to the C.C., about half of which were liquefying micro-organisms, and many producing greenish discoloration, and odour of putrefaction. No such result could be obtained from a perfectly fresh sample of pure milk. It indicates contamination from the air or some other source, possibly water. But neither in this sample, nor in the other samples of milk received at the same time, was I able to succeed in isolating any new micro-organism, or to ascertain any cause for the outbreak at the Infirmary,

Sample D., supplied by the contractor from milk No. 2, Eady Whissendine, No. 265A, contained numerous micro-organisms, but there were not many liquefying organisms present, or the same septic odour in the cultivations. It was unquestionably the best of the three samples.

Sample E. supplied by Eady Whissendine, No. 1,557, contained over 700,000 micro-organisms to the C.C., and the same remarks which were applied to C. must be emphasized in the case of Sample E.

These results confirm those obtained in my previous investigations of milk and water under suspicion of producing an outbreak of skin disease, but, though I am unable to regard the disease as arising either from the water or the milk, I am of opinion that better milk should be supplied to the Infirmary.

(Signed) Edgar M. Crookshank, M.B.,
Professor of Comparative Pathology and
Bacteriology, and Director of the Laboratory,
King's College, London.

ADDENDUM D.

Cases of Epidemic Skin Disease: Shoreditch Infirmary.

Males.

No.	Ward.	Transfer.	Name.	Age	Admission.	Disease.	Previous Illness.	Commencement of Eruption.	Diet and Extras.	How long on previous to the Eruption.	Relapse.	Result.	General Condition at time of Attack.	Remarks.
1	11. W.B.	12. W.B.	William W.	59	30.3.94	Exfoliating dermatitis.	Ch. ulcer of leg.	11 weeks before admission	Ordinary diet	-	-	Cured. 13.6.94.	Debilitated.	The man says that he had a similar attack in Essex, which he attributed to drinking bad water.
2	11. W.B.	12. W.B.	Arthur H.	41	24.6.93	"	Ulcer of leg	26.3.94	4. and ½ pint milk.	6 weeks	Yes - 18.6.94	Cured	"	This man had erysipelas in his leg and albuminuria.
3	4. E.B.	12. W.B.	Thomas H.	65	10.10.93	"	Gout	31.3.94	3. " "	3 months	Yes - 28. 594	"	"	On his relapse swollen face and eyes, and delirious; temp., normal.
4	12. W.B.	12. W.B.	John H.	73	16.1.94	"	Bronchitis	9.4.94	3. " "	7 weeks	Yes	"	"	The eyes were swollen, ears running, skin peeling in large flakes from hands and feet: temp., 103°.
5	11. W.B.	12. W.B.	George S.	60	28.12.93	"	Mœmoptosys cardiac disease.	17.4.94	4. ½ pint beef tea, and ½ pint milk.	2½ months	"	Dead from bronchitis and heart disease.	"	Testicles swollen, eruption afterwards became pustular, glandular abscess formed near joints and in different parts of body; temp., 101·3°.
6	3. E.B.	8A, E.	Stephen T.	54	9.9.93	"	Morbus Brightii.	21.4.94	5. ½ pint milk	4 "	No	Nearly well	"	Did not spread over body so quickly as in other cases.
7	11. W.B.	12. W.B.	John G.	71	20.12.93	"	Gastritis	22.4.93	3. ½ "	2 "	Yes	Still relapsing.	"	Had hæmaturia subsequent to relapse; albuminuria.

W.B. = West Block. E.B. = East Block. C.B. = Central Block. L.I.W. = Lying-in-Ward.

No.	Ward.	Transfer.	Name.	Age	Admission.	Disease.	Previous Illness.	Commencement of Eruption.	Diet and Extras.	How long on previous to the Eruption.	Relapse.	Result.	General Condition at time of Attack.	Remarks.
21	13. W.B.	12. W.B.	James P.	60	28.9.94	Exfoliating dermatis.	Ulcer of leg	18.6.94	3. ½ pint milk.	2 months.	No; no temp.	Cured	Debilitated.	He was in the same ward as P., but at the end of the ward. No communication between them.
22	8. E.	- -	George B.	78	29.3.93	„	Fracture of femur.	8.7.94	3. 1 „ „	2½ „	No	Weak	„	Appeared on hands and arms first.
23	11. W.B.	12. W.B.	John C.	49	23.5.94	„	Gout	11.7.94	4. ½ „ „	1½ „	Yes	Cured	„	Began in scrotum, and then over the body. No alb.
24	2. E.	- -	Walter C.	36	2.1.94	„	Rheumatic arthritis.	12.8.94	3. ½ beef tea, and ½ milk.	1½ „	- -	Progressing	„	Began on knee; urticarial in appearance at first; intensely itchy.

Females.

1	Separation Ward.	W.B.	Elizabeth H.	77	6.2.94	Eczematous dermatitis.	Ch. bronchitis and eczema.	15.4.94	4. ½ pint milk, ½ pint beef tea.	15 days	Yes, 15.4.94.	Died	Debilitated.	She had eczema when admitted and she became worse, red all over the body, and peeled off in large flakes.
2	1. W.B.	- -	Ann H.	53	6.8.91	Exfoliating dermatitis.	Epilepsy	21.4.94	3. ½ pint milk	4½ months	No	Cured	„	Peeling slight.
3	10. W.B.	- -	Ann H.	59	30.1.91	„	Cardiac disease and bronchitis.	21.4.94	4. ½ „	3 „	Yes	„	„	No albumen.
4	2. W.B.	- -	Matilda A.	72	12.1.94	„	Ch. bronchitis	28.4.94	3. ½ „	14 days	No	„	„	„

W.B. = West Block. E.B. = East Block. C.B. = Central Block. L.I.W. = Lying-in-Ward.

No.	Ward.	Transfer.	Name.	Age	Admission.	Disease.	Previous Illness.	Commencement of Eruption.	Diet and Extras.	How long on previous to the Eruption.	Relapse.	Result.	General Condition at time of Attack.	Remarks.
5	Workhouse.	4 E.B.	Nellie C.	22	7.5.94	Exfoliating dermatitis.	Parturition, 26.12.93.	- -	Infirm diet, 1 quart milk.	4 months	No	Had been confined.	Debilitated.	Cannot obtain any history to be relied on.
6	1A. W.B.	- -	Hannah R.	35	14.10.92	„	Neuritis	1.5.94	3. ½ pint milk	12 „	„	Cured	„	Peeling slight.
7	6. E.	- -	Elizabeth B.	80	8.1.93	„	Morbus cordis.	5.5.94	4. ½ pint milk, 1 egg.	4 „	„	Improving	„	Was in a very weak state.
8	7. W.B.	- -	Jane J.	74	12.5.93	„	Ch. bronchitis	6.5.94	5. ½ pint milk	12 „	„	Cured	„	No albumen.
9	1A. W.B.	- -	Eliza W.	60	30.1.94	„	Whitlow	12.5.94	5. ½ „	1½ „	„	„	„	Peeling slight.
10	1A. W.B.	- -	Elizabeth B.	80	17.1.93	„	Senility and fracture of femur.	16.5.94	5. ½ „	1½ „	„	„	„	Peeling slight, albuminuria.
11	3. E.	- -	Charlotte F.	59	18.10.93	„	Ulcer of legs	19.5.94	3. ½ „	4 „	„	- - -	„	Had a gastric attack about the end of month.
12	L.I.W.	1A. W.	Martha P.	15	5.4.94	„	Parturition	26.5.94	3. 2 pints milk	7 weeks	Yes	Cured	„	Peeling all over, had eczema of ears, albuminuria.
13	1A. W.B.	- -	Henrietta T.	68	6.12.93	„	Ch. bronchitis	28.5.94	4. ½ pint milk, ½ beef tea.	2 months	No	„	„	Peeling slight.
14	3. W.B.	- -	Ellen J.	46	13.4.94	„	Sprained knee	1.6.94	3. ½ pint milk	2 „	„	„	„	No albumen.
15	7. W.B.	- -	Mary Ann M.	53	12.7.93	„	Cardiac disease.	1.6.94	4. ½ pint milk, ½ beef tea.	5 „	„	„	„	„
16	7. W.B.	- -	Elizabeth B.	60	28.5.94	„	Ulcer of leg	3.6.94	4. ½ pint milk	6 days	„	„	„	„
17	Workhouse.	6. E.B.	Charlotte C.	62	5.6.94	„	Ch. bronchitis	4.6.94	In the workhouse, on infirm diet, and 1 pint milk.	16 months	„	Improving	„	Temp., 103·4°, 8.6.94.; 103°, 9.6.94.
18	6. W.B.	- -	Laura D.	17	20.4.93	„	Myxœdema	10.6.94	3. ½ pint milk	9 „	„	Cured	„	No albumen.
19	4. E.B.	- -	Eliza R.	80	29.3.94	„	Dissemd. sclerosis.	12.6.94	4. ½ pint milk, ½ beef tea.	10 weeks	„	„	„	——

W.B.=West Block. E.B.=East Block. C.B.=Central Block. L.I.W.=Lying-in-Ward.

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No.	Ward.	Transfer.	Name.	Age	Admission.	Disease.	Previous Illness.	Commencement of Eruption.	Diet and Extras.	How long on previous to the Eruption.	Relapse.	Result.	General Condition at time of Attack.	Remarks.
20	6. E.B.	- -	Harriet W. -	33	23.5.94	Exfoliating dermatitis.	Phthisis -	13.6.94	4. ½ pint milk	5 weeks -	No -	Improving -	Debilitated.	Began in face, neck, and chest.
21	2. W.B.	- -	Sarah V. -	65	25.5.94	„	Cardiac disease.	20.6.94	4. ½ pint milk, ½ beef tea.	6 „ -	Yes -	Still has rash	„ -	Rash herpetic, then eczematous.
22	6. E.B.	- -	Mary R. -	79	12.2.93	„	Hemiplegia	24.6.94	4. ½ pint milk	5 „ -	No -	Improving -	„ -	Appeared on hands and arms first.
23	Workhouse.	3. E.B. -	Priscilla T. -	49	27.6.94	„	Phthisis -	28.6.94	Workhouse infirm diet.	4 years -	„ -	- „ -	„ -	Had no milk but in her tea, she was in the infirmary laundry.
24	2. W.B.	- -	Emma P. -	67	17.10.93	„	Vertigo -	30.6.94	4. ½ pint milk	15 days „	-	Cured -	„ -	No albumen.
25	Workhouse.	6. E.B. -	Sophia G. -	64	30.7.94	„	Nil - -	10.7.94	Workhouse infirm diet.	7 months -	„ -	Improving -	„ -	Had no milk except in tea, unless she took any when acting as servant in the officers' mess room, which she denies.
26	2. W.B.	- -	Frances S. -	64	4.6.94	„	Ch. bronchitis	11.7.94	4. ½ pint milk, ½ beef tea.	1 month -	Yes -	Still has rash	„ -	——
27	6. E.B.	- -	Eliza M. -	79	19.11.90	„	S. debility -	14.7.94	4. ½ pint milk, 2 eggs.	2 months -	No -	Improving -	„ -	——
28	3. W. -	- -	Ellen A. -	69	9.7.94	„	Ulcerated leg	20.7.94	4. ½ beef tea -	11 days -	„ -	„ -	Poor -	Albuminuria, rash followed by profuse desquamation.
29	C.B. -	- -	Ann M. -	33	29.7.93	„	Epilepsy -	31.7.94	3. ½ pint milk	8 months -	„ -	- „ -	Debilitated.	This patient is in C. block, quite separate from the other patients suffering from this disease.

W.B. = West Block. E.B. = East Block. C.B. = Central Block. L.I.W. = Lying-in-Ward.

D. M. Forbes.

ADDENDUM E.

Shoreditch Infirmary.

Diet Table.

Diets.	Dinner.									Breakfast and Supper.					Daily.
	Meat.	Potatoes.	Bread.	Mutton Broth.	Rice Pudding.	Milk.	Fish.	Butter.	Porter.	Bread.	Butter.	Tea.	Milk.	Sugar.	Gruel.
	Oz.	Oz.	Oz.	Pt.		Pt.	Oz.	Oz.	Pt.	Oz.	Oz.	Pt.	Pt.	Ozs.	Pts.
No. 2. Full. Males	6	12	—	—	—	—	—	—	—	7	—	1	—	—	—
No. 2. Full. Females	5	12	—	—	—	—	—	—	—	5	—	1	—	—	—
No. 3. Medium. Males	4	12	—	—	—	—	—	—	—	6	—	1	—	—	—
No. 3. Medium. Females	4	12	—	—	—	—	—	—	—	5	—	1	—	—	—
No. 3g. Females	—	—	—	—	—	—	—	—	—	5	—	1	—	—	2
No. 4. Low. Males	—	—	2	1	1	—	—	—	—	4	—	1	—	—	—
No. 4. Low. Females	—	—	2	1	1	—	—	—	—	4	—	1	—	—	—
No. 5. Fish. Males	—	12	—	—	—	—	8	—	—	5	—	1	—	—	—
No. 5. Fish. Females	—	12	—	—	—	—	8	—	—	4	—	1	—	—	—
No. 6. Chop. Males	Chp. 6	12	—	—	—	—	—	—	—	6	—	1	—	—	—
No. 6. Chop. Females	6	12	—	—	—	—	—	—	—	5	—	1	—	—	—
No. 7. Children. Sun. Tues. Thurs.	3	6	—	—	—	—	—	—	—	4	½	—	½	—	¼
No. 7. Children. Mon. Wed. Friday	—	—	—	1	1	½	—	—	—						
No. 7. Children. Saturday	—	6	—	—	—	—	6	½	—						
Infants under 2 years	—	—	7	—	—	2	—	½	—	—	—	—	—	—	Weekly 4

Note.—All articles *not included in the above* Dietary are to be treated as extras.

Ingredients to be Used.

Beef Tea.—To contain 1 lb. of meat to 1 pint (leg of mutton pieces or chuck).

Mutton Broth.—For 1 pint: 4 ozs. mutton, mutton liquor, and mutton bones, 1 oz. Scotch barley, ½ oz. of herbs and onions, salt and pepper as required.

Tea.—2 ozs. of tea, 5 ozs. of sugar, and 1 pint of milk to 8 pints.

Rice or Arrowroot Pudding.—1 oz. of rice or arrowroot, ¼ pint of milk, ½ oz. of sugar.

Oatmeal Gruel.—2 oz. of oatmeal to 1 pint of water.

D. M. Forbes, Medical Officer.

Appendix A. No. 11.
On the Origin and Spread of Epidemic Diseases in Relation to Sanitary Conditions. By Dr. Oppenheim.

ADDENDUM F.

Parish of St. Leonard, Shoreditch.
Dietary Tables for the Workhouse.

No. 1 Dietary Table for the Able-bodied of all Ages.	Breakfast.		Dinner.							Supper.	
	Bread.	Oatmeal Gruel.	Cooked Meat.	Fish.§	Potatoes or other Vegetables.	Bread.	Rice or Suet Pudding.	Broth or Pea Soup.	Irish Stew.	Bread.	Oatmeal Gruel or Broth.*
	Ozs.	Pints.	Ozs.	Ozs.	Ozs.	Ozs.	Ozs.	Pints.	Ozs.	Ozs.	Pints.
Sunday - Men	6	1½	5	—	12	—	—	—	—	6	1½
Sunday - Women	5	1	4½	—	12	—	—	—	—	5	1
Monday - Men	6	1½	—	—	—	4	—	1½	—	6	1½
Monday - Women	5	1	—	—	—	4	—	1½	—	5	1
Tuesday - Men	6	1½	5	—	12	—	—	—	—	6	1½
Tuesday - Women	5	1	4½	—	12	—	—	—	—	5	1
Wednesday - Men	6	1½	—	12	8	2	—	—	—	6	1½
Wednesday - Women	5	1	—	12	8	2	—	—	—	5	1
Thursday - Men	6	1½	—	—	—	—	16	—	—	6	1½
Thursday - Women	5	1	—	—	—	—	16	—	—	5	1
Friday - Men	6	1½	—	—	—	2	—	—	24	6	1½
Friday - Women	5	1	—	—	—	2	—	—	20	5	1
Saturday - Men	6	1½	—	—	—	—	16	—	—	6	1½
Saturday - Women	5	1	—	—	—	—	16	—	—	5	1

* Broth.—M. 1½ pts., F. 1 pt.—To be given for supper twice each week, in lieu of gruel, the particular days to be at the discretion of Master.
§ Fish.—With melted butter.

Dietary Tables for the Workhouse—*continued.*

No. 2 Dietary Tables for the Infirm of all Ages.	Breakfast.			Dinner.							Supper.		
	Bread.	*Butter.	Tea.	Cooked Meat.	Fish.‡	Potatoes or other Vegetables.	Bread.	Rice or Suet Pudding.	Broth or Pea Soup.	Irish Stew.	Bread.	*Butter.	Tea.
	Ozs.	Oz.	Pt.	Ozs.	Ozs.	Ozs.	Ozs.	Ozs.	Pts.	Ozs.	Ozs.	Oz.	Pt.
Sunday. Men	5	½	1	4	—	12	—	—	—	—	5	½	1
Sunday. Women	4	½	1	4	—	12	—	—	—	—	4	½	1
Monday. Men	5	½	1	—	—	—	4	—	1½	—	5	½	1
Monday. Women	4	½	1	—	—	—	4	—	1½	—	4	½	1
Tuesday. Men	5	½	1	4	—	12	—	—	—	—	5	½	1
Tuesday. Women	4	½	1	4	—	12	—	—	—	—	4	½	1
Wednesday. Men	5	½	1	—	12	8	2	—	—	—	5	½	1
Wednesday. Women	4	½	1	—	12	8	2	—	—	—	4	½	1
Thursday. Men	5	½	1	—	—	—	—	16	—	—	5	½	1
Thursday. Women	4	½	1	—	—	—	—	16	—	—	4	½	1
Friday. Men	5	½	1	—	—	—	2	—	—	24	5	½	1
Friday. Women	4	½	1	—	—	—	2	—	—	20	4	½	1
Saturday. Men	5	½	1	4	—	12	—	—	—	—	5	½	1
Saturday. Women	4	½	1	4	—	12	—	—	—	—	4	½	1

* An allowance of dripping may be given, in lieu of butter, when ordered by the Guardians.

‡ Fish.—With melted butter.

INGREDIENTS.

SOUP.			BROTH.			GRUEL.		
Name and Description of Ingredient.	Quantity of each Ingredient to a Gallon.		Name and Description of Ingredient.	Quantity of each Ingredient to a Gallon.		Name and Description of Ingredient.	Quantity of each Ingredient to a Gallon.	
	Ozs.	Pts.		Ozs.	Pts.		Ozs.	Pts.
Australian meat - - -	16	—	Raw meat - - - -	8	—	Oatmeal - - - -	16	—
Peas - - - - -	—	1½	Oatmeal - - - -	8	—			
Vegetables - - - -	24	—	Vegetables - - -	4	—			
			Added to liquor in which meat for meat diet is boiled.					
Meat remains in soup and broth.								

Ingredients—*continued.*

Puddings.			Irish Stew.			Tea.		
Name and Description of Ingredient.	Quantity of each Ingredient to a Gallon.		Name and Description of Ingredient.	Quantity of each Ingredient to a Gallon.		Name and Description of Ingredient.	Quantity of each Ingredient to a Gallon.	
	Ozs.	Lbs.		Ozs.	Pints.		Oz.	Pts.
Suet Pudding—			Australian meat - - -	2	—	Tea - - - -	1	—
Flour - - - -	9	—				Milk - - - -	—	1
Suet - - - -	3	—	Vegetables—					
			Potatoes - - -	4	—			
Rice Pudding—			Carrots and onions - -	2	—			
Rice - - - -	4	—	Rice - - - -	2	—			
Milk - - - -	1 pint	—	Flour - - - -	2	—			

Sanctioned provisionally by the Local Government Board, and by order of the Board of Guardians.

October, 1886.

Robert Clay,
Clerk to the Guardians.

Local Government Board letters, 6th May, 1880.
10th October, 1884.

Resolution of Guardians *re* Fish, 3rd October, 1883.

App. A. No. 11.

On an Outbreak of Epidemic Skin Disease; by Dr. Copeman.

III.—REPORT ON FURTHER OUTBREAKS OF AN EPIDEMIC SKIN DISEASE IN CERTAIN METROPOLITAN WORKHOUSE INFIRMARIES.

During the summer of this year, and subsequent to the occurrence of cases of the unusual form of skin disease at the Bethnal Green and Shoreditch Infirmaries, which has formed the subject of the foregoing reports, a number of other and similar outbreaks of greater or less magnitude have appeared in certain other infirmaries and workhouses. Concerning these I purpose giving in the present report such information as I have been able to gather.

Information having been received from the Medical Superintendents of two or three of these other institutions of the appearance of the disease in question among the patients under their charge, it appeared desirable to learn, as nearly as possible, to what extent the malady had recently prevailed in the Metropolis. With this object, Dr. Downes addressed, in September 1894, a circular letter to the medical officers of each of the Metropolitan Infirmaries, asking whether any cases of the disease had been observed during the present year; what, if any, was their number; and whether there were any cases under treatment at the *time of* writing.

The replies received to this circular showed that although one or more, and in two instances a considerable number of, cases of the so-called "epidemic dermatitis" were at the time under treatment, the disease had been by no means so widely spread or as prevalent as *might* have been anticipated from various statements in reference to the matter which had found their way into the medical and lay press.

Replies in the negative as to occurrence of the disease during the present year were received from the following institutions:—

METROPOLITAN INFIRMARIES and WORKHOUSES.—EPIDEMIC SKIN DISEASE.

St. George's Union Infirmary.
" " Workhouse.
Holborn " "
" " Infirmary.
St. Saviour's " "
" " (Three) Workhouses.
Wandsworth and Clapham Union Infirmary.
Mile End Infirmary.
St. Pancras Workhouse.
" (St. Anne's Home).
" Infirmary.
Lewisham "
" Infirmary (not yet open).
Bethnal Green Workhouse.
" " Infirmary.
Strand Union "
" " Workhouse.
St. Mary, Islington.
St. Giles-in-the-Fields and St. George, Bloomsbury, Workhouse.
" " " " Infirmary.
Camberwell Union (Gordon Road) Workhouse.
St. John, Hampstead, Infirmary.

Whitechapel Infirmary.
Greenwich Union Workhouse.
„ „ Infirmary.
Paddington Infirmary.
Islington Infirmary.
„ Workhouse.
Poplar „
St. Olave's „ (Tanner Street).
„ „ Infirmary.
Chelsea Infirmary.
New Wansdworth Infirmary.
Parish Street Workhouse (Horsleydown).
Lambeth Infirmary.
„ Workhouse.
Westminster Workhouse.
Woolwich Union Workhouse.
„ „ Infirmary.
Hackney Union Infirmary.
„ „ Workhouse.
Stepney Union, Ratcliff, Workhouse.

On the other hand, the replies giving details as to presence of cases of the disease, either at the time when Dr. Downes's circular was issued (September 1894) or earlier in the year, were received from—

Stepney Union Infirmary;
St. George's-in-the-East Infirmary;
St. Mary Abbott's Infirmary, Kensington;
Marylebone Infirmary, Notting Hill;
Fulham Infirmary (2 cases only);
City of London Infirmary;
Camberwell Infirmary (1 case only).

In addition to these must be mentioned Shoreditch Infirmary, on which I have already reported, and to which a circular had not been sent; and also the Marylebone Workhouse, the cases from which place had, I found, been passed on for the most part to the Infirmary at Notting Hill. Two cases also had been transferred from the City of London Union Workhouse at Homerton to the City of London Infirmary in Bow Road as suffering from "dry eczema," which were afterwards recognised as being of the epidemic variety.

On receipt of the replies to Dr. Downes's circular letter, I at once visited nearly all the infirmaries in which cases of the epidemic skin disease were under treatment, or in which cases had occurred earlier in the year, including the City of London Infirmary, whereat, since my report on it to the Board, several additional cases had occurred. I also visited the Marylebone Union Workhouse, as I learnt that Mr. Rayner, the Medical Superintendent, had there some cases under his charge which had not been transferred to the infirmary at Notting Hill.

As the result of my visits I found in certain instances that the number of patients actually suffering from the disease was somewhat in excess of that which had been supplied to Dr. Downes, either for the reason that cases had occurred subsequently to the date on which information had been sent to him, or that their nature had not previously been recognised.

Subject to such additions, the number of patients attacked by epidemic skin disease during the present year, and also the number of deaths

referred to that malady which have occurred among such patients up to the end of September 1894 are as follows:—

Name of Institution.	Cases.	Deaths.
St. George-in-the-East Infirmary	126	17
St. Marylebone "	67	7
Shoreditch "	66	6
Stepney "	36	—
City of London "	29	—
St. Mary Abbotts, Kensington, Infirmary	15	3
Fulham Infirmary	2	2
Camberwell Infirmary	1	—
Total	342	35

From these figures it appears that while the fatality rate has varied somewhat in the different institutions, the cases which have terminated fatally form 10·234 per cent. of the whole number attacked.

It is possible, however, that the numbers (both cases and deaths) given above are somewhat too high, as, at the St. George-in-the-East Infirmary more particularly, certain cases are included in the statistics afforded by Dr. Bowlan, the Medical Superintendent, in which no skin affection developed during the whole cause of the illness. Dr. Bowlan justifies such inclusion for the reason that the cases appeared concurrently with others in which a quiet typical rash presented itself, the symptoms being in all respects apparently identical, with the single, though not unimportant, exception of the usual skin lesion. The question being thus raised, it will be necessary to discuss it more fully further on in this report. It may be mentioned here, however, that if the cases in which no definite rash appeared—70 in number—be subtracted from the total cases notified from this institution, the figures, subject to such correction, will be 56 instead of 126, and the total number of attacks during the year in all the institutions concerned will be reduced from 342 to 272; while of the 17 death in this particular institution (of which only six occurred in patients who had presented a typical rash), 11 would have to be subtracted, leaving for all the institutions a corrected total of 24.

Additional Facts respecting the History of the Disease.

In all probability the disease under consideration in this and former reports is by no means a new one even in this country. At the time that Dr. Savill brought forward an account of the outbreak at the Paddington Infirmary, Mr. Hutchinson called attention to an epidemic which occurred in the Greenock Parochial Asylum in 1888. In America, Dr. Henry Blanc,* dermatologist to the Charity Hospital, New Oleans, published in 1892 an account of certain cases of what he terms *Erythema Exfoliativum Recurrens.* His paper is specially of interest, however, because he gives an extensive bibliography of the disease, his references going back to a paper by Benjamin Gooch† in the "Philosophical Transactions" for 1769. Among more recent writers on the subject are Leloir and Vidal,‡ who gave the name of ***Relapsing Exfoliative***

* International Clinics, Vol. III., 1892.
† Account of a singular separation of the cuticle.
‡ Traité descriptif des Maladies de la Peau, 1891. 3e livraison, p. 163.

Dermatitis to this disease, a fact of which apparently Dr. Savill was not aware when he himself proposed the very similiar one of *General Exfoliative Epidemic Dermatitis*. The latter term, be it noted, makes no reference, as do those employed by Leloir and Vidal, and by Blanc, to the proneness to relapse which Dr. Savill himself admits is a marked feature of the disease.

In a recent paper‡ Dr. Savill expresses the opinion that the term "epidemic skin disease," which I have invariably employed in my reports in dealing with this particular malady, is preferable, as indicating the conditions under which the malady first attracted attention in this country. He further states that the name "general exfoliative epidemic dermatitis," besides being cumbersome, "is not altogether appropriate." With reference to this point there is an undoubted advantage in the use of a term which does not entail the expression of any definite views as to the etiology, characteristics, or pathology of a disease concerning which unfortunately at present comparatively little is known. For these and for other reasons the term "epidemic skin disease" appears indeed to have generally commended itself.

The circumstances of certain of the outbreaks of epidemic skin disease at present under consideration were somewhat different from those of former outbreaks on which I have reported. Thus, in 1893, at Bethnal Green Infirmary, and in the more recent outbreaks at the Shoreditch and St. George-in-the-East Infirmaries, the disease suddenly attacked almost simultaneously a considerable number of inmates, all of whom had been practically confined for some time previously to the particular institution where they were under treatment for other diseases, mostly of a chronic nature.

On the other hand, during the present year more particularly, in certain other infirmaries, the cases have not arisen in so definite a manner, having been scattered over considerable periods of time; while many of the cases, especially the earlier ones, have been received from outside, as, for instance, from workhouses, Salvation Army shelters, and private dwellings, for the most part of the poorest class. Where this has been so, the type of the disease has, especially in some instances, been of a decidedly mild character. More particularly was this the case during the most recent outbreak at the City of London Infirmary, where, with 29 cases attacked, not a single death resulted. At the same time there has seldem been evidence of infection or contagion being conveyed from those suffering attack to the medical officers, nurses, or other attendants. At the St. George-in-the-East Infirmary, however, where the type of the disease was severe, and where cases cropped up in fairly rapid succession, as many as 10 nurses in all were attacked, beside other officials. But whether these attendants owed their illness to personal infection it is not possible to say, as their attack may not unlikely have been due to some cause common to patients and attendants alike.

From what has been stated, it will be apparent that the outbreaks of this epidemic skin disease which have occurred during the present year have presented certain different features as regards their course and duration. Undoubtedly confusion of ideas with reference to the etiology of the disease has been fostered by the non-appreciation of these differences in the various outbreaks. This is a question which will

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* "Lancet," Sept. 29, 1894, p. 732.

require further discussion later on in this report, in the section dealing with the possible *exciting causes* of the disease.

It may, perhaps, be again stated here that personal visits have been paid by me to all the institutions where more than one or two cases had occurred, and that I took the opportunity of myself examining as many of the patients supposed to be suffering from the disease as possible, in order to satisfy myself in each instance that the diagnosis of epidemic skin disease was justified.

Certain cases there have been, as already mentioned, at St. George-in-the-East Infirmary, concerning the true nature of which considerable doubt may well exist, seeing that they at no time during the whole course of their illness presented any recognisable skin affection. Dr. Bowlan, the Medical Superintendent, however, is of opinion that they are in reality to be regarded as cases of the disease in question, for the reason that all the symptoms from which they suffered, including malaise, sickness, and feverishness, were of similar character to what was observed coincidently in point of time in other patients who were undoubtedly the subjects of epidemic skin disease. The interesting question of course arises as to whether these patients were not suffering from some concurrent malady of entirely different nature, such, for instance, as influenza.

In reference to this question, Dr. Bowlan has supplied me with a memorandum, which I append to this report, in which he sets out the reasons which in his opinion justify the inclusion of these anomalous cases in the same category with those in which a definite skin lesion was commonly one at any rate of the most marked features of the illness. It was, indeed, the particular feature to which attention in the past has been mainly directed, as is obvious from the term ("dermatitis") originally proposed by Vidal, Leloir, and Savill, as descriptive of the malady in question.

Of the various outbreaks, the consideration of which forms the subject matter of the present report, that which came under observation at the City of London Infirmary has been much the least severe, no constitutional symptoms whatever, according to the statement made to me by the Assistant Medical Officer, having been noticed in any of the patients attacked by the disease. The general mildness of type also of the disease at this institution during the present year is seen from the fact that not a single one of the patients attacked has succumbed to the disease.

These cases, 29 in number, were spread over a considerable period of time, the first having come under notice on April 6th, 1894, and the last on August 1st. All the persons attacked were over 50 years of age, and although in nearly half the total number a relapse occurred at a longer or shorter interval, not one of those patients still in the Infirmary who had suffered attack in the previous year again contracted the disease.

Towards the end of my investigation I learnt that cases of epidemic skin disease had recently come under notice at the Stepney Infirmary; but on visiting the institution I found that the present Medical Officer had only been appointed recently, and that no records were available. As far as could be learnt, it appears, however, that the cases, comparatively few in number, had appeared one at a time, extending over a period of nearly seven months, that none of them had been of severe type, and that in all probability some had been admitted from outside while actually suffering from the disease.

Etiology.

What has been said under this heading in my previous reports, for the most part applies equally in the case of the outbreaks which have been the subject of investigation during the present year.

A.—Predisposing Causes.

1. *Age.*—With reference to this point it has been almost the universal rule that no persons below middle age have been attacked. Only a few exceptions have come under notice. Thus, for instance, at the St. George-in-the-East Infirmary the very first person in whom the disease asserted its presence was an infant at the breast. This child, which was in the lying-in ward, was found on July 19th to present a definite rash, which on the following day showed itself also in the case of this child's mother. At the Marylebone Infirmary a boy, four years old, who was under treatment for rickets, was attacked on September 1st: while in a recent outbreak at a workhouse outside the metropolitan area, two newly-born children were attacked with the disease, whereas the mothers, according to Dr. Wallace, "did not contract the "disease."

Advancing years, as already stated, seem to cause a greater predisposition to attack, and many of the patients who have suffered from the complaint during the epidemic have been 70, 80, and in some cases as much as 90 years of age. Tables are appended showing, for the Infirmaries where the greater number of cases have occurred, the proportion of attack at each of several age-periods.

2. *Sex.*—The tables referred to above also show for each sex the proportion of persons attacked at each age-period. In this respect it will be observed that, looking to the total number of the persons attacked amongst the occupants of these two Infirmaries at the [illegible] of each of the outbreaks, the incidence of the disease has been much heavier on the male than on the female sex.

3. *Previous Ill-health and Hospitalism.*—It has been abundantly evident that persons suffering from chronic and debilitating diseases, particularly if they are at the same time of advanced age, are much more liable to attack than persons in the enjoyment of good health. This fact has been specially obvious in the [illegible] Workhouse and Infirmary form practically one building, the attack-rate in the latter being invariably much higher in the latter than in the former portion of the institution. In an earlier epidemic at Bethnal Green, which I have already reported, certain persons in attendance on the patients, including the Medical Superintendent, were attacked by the disease, and in the latter outbreaks at present under consideration a few similar incidents have been recorded. Thus, at the Marylebone Infirmary a porter, who about the time of the first appearance of the disease during the present year had been put on bathing duty for some weeks, contracted the disease: while at St. George-in-the-East Infirmary, as already noted, no less than eight nurses suffered from the complaint in the Infirmary itself, and two other nurses at the Workhouse, in addition to the labour master, and the assistant matron. I was unable to learn whether in each instance those who had thus been attacked had previously been more or less out of health, but the mere fact of the extra strain involved by the sudden occurrence of numerous cases of this disease, with the consequent increase of work thrown on the staff, renders this not improbable.

It would also appear that the cubic amount of air space per patient provided in the wards is of considerable importance in reference to the spread of the disease, as is also the aggregation of patients suffering from the disorder when the type is severe. At the City of London Infirmary the Assistant Medical Officer is further of opinion that the virulence of the disease tends to become greatly increased when the patients suffering from it are brought together in a single ward (one for each sex) for purposes of isolation. At the same time, however, he considers that under the circumstances the disease is, as a rule, more likely to run a shorter course (averaging about three weeks in such as recover) than when it appears in milder form in the first instance.

4. *The particular malady for which patients were being treated* previous to invasion of the system by this disease, appears to exert little or no influence in determining the attack. Of the cases sent to the Infirmary from the Marylebone Workhouse, the majority had previously suffered from gout, but this did not hold good with reference to other institutions. Apparently any diseases that are debilitating are about equally likely to have superadded to them an attack of the pecular skin disease under consideration.

5. *General Sanitary Condition of the Institution.*—In the case of the Bethnal Green outbreak, as I have stated in a previous report, *it* appeared hardly possible but that the extent of the epidemic and the severity of type witnessed in the case of many of the patients affected, may have depended in some measure on the fact that the sanitary condition, and also the general arrangements for attendance on and treatment of the patients in this Infirmary, leave much to be desired. In another connexion also, attention was directed to the fact that the Regent's Canal which was in a very foul condition, passes within about 50 yards of the Infirmary at one point, where indeed is situate the ward in which the first patient to be attacked was being lodged.

In the majority of the other institutions in which the epidemic skin disease appeared in 1894, in less severe form, the general sanitary conditions, as also the arrangements in connexion with the treatment of the patients, are decidedly superior to those which were found to exist at the Bethnal Green Infirmary. It is perhaps worthy of note, however that the St. George's-in-the-East Infirmary, which has experienced heavy incidence of the disease in severe type during the present year, is on a site which Dr. Bowlan, the Medical Superintendent, regards as saturated with moisture. He points out that the Infirmary is built on low-lying ground, surrounded on three sides by extensive docks, while on the fourth side, and within a comparatively short distance, is the River Thames. Whether or not the general conditions of site of this Infirmary had any causal connexion, direct or indirect, with the outbreak there of skin disease it is impossible to say, but the possibility of such relationship appears worthy of future investigation.

B.—Exciting Causes.

1. *Food.*—In my previous reports on the etiology of epidemic skin disease as observed more particularly at the Bethnal Green and the Shoreditch Infirmaries during the years 1893 and 1894, I have called attention to certain facts which appear not inconsistent with the theory that some particular article or articles of *food* may have had, in some instances at any rate, causal connexion with the outbreak; and further that of the various articles comprised in the dietaries of these Infirmaries, *milk* is that on which suspicion has mainly fallen.

In the more recent prevalence of the present year, this question has again cropped up, and it is therefore desirable to discuss the various circumstances which tend either to support or, on the other hand, to negative, inference of conveyance by such means of the specific poison of the disease in question. I again directed special attention to all the various articles of food contained in the different dietaries in use in the Infirmary and Workhouse respectively. It soon, however, became apparent that of these, practically all could be excluded with the solitary exception of milk.

Various suggestions however have been made as to other channels by which the skin eruption and other symptoms of the disease might have been brought about, among which may be mentioned the condition of the *drinking water* in use and *irritation of the skin* referred to various articles of clothing, such as coarse undervests, or from new nightdresses worn before having been washed and so still containing in their texture a considerable amount of size or other stiffening material. Careful investigation, however, of the circumstances of each individual outbreak has completely failed to afford any evidence whatsoever in support of such inferences. So too with milk, in certain of the more recent outbreaks, especially at the City of London Infirmary, the Kensington (St. Mary Abbott's) Infirmary, the Fulham Infirmary, and probably also the Marylebone Infirmary, it appears improbable that the outbreaks observed in these institutions were set going by this agency. On making investigation of this question at the above Infirmaries, I was informed in each instance that as far as was known the milk had been of good quality, and that no noticeable change for the worse had been observed in the supplies received during at least a month previous to the appearance of the first cases of the disease, and that there had not been any complaint either from members of the staff or from patients with reference to the condition of the milk during a similar period.

At two of these Infirmaries all the milk served out to the patients is "boiled" previous to use, although in one of these two institutions such is not the case with that portion of the general supply which is reserved for the use of the resident staff. In these instances, supposing that the milk is really brought to the boiling point and kept for a time at such a temperature, it is probable that any micro-organisms previously present in it would be destroyed by the process. It should be borne in mind, however, that boiling would not necessarily destroy the dangerous properties of a non-living chemical poison, supposing such to have been introduced in some way or other into the milk. The fact also that where the milk used for the patients was boiled while that of the staff was not, those who suffered from the disease in question were nevertheless found practically among the patients alone, does not carry as much weight as at first sight might appear to be the case, seeing that attacks are in almost every instance confined to the aged and debilitated.

It deserves to be noted, however, that in the case of those institutions in which such information as I was able to gather did not tend to implicate the milk service, the epidemic disease did not attack a large number of patients simultaneously as in the case of the previous outbreak at the Bethnal Green Infirmary, and at St. George-in-the-East Infirmary. In the last-named institution the first case was quickly followed by a number of others, scattered all over the Infirmary, which therefore made it appear highly probable that attack must in all these cases have been brought about by some common cause which, however, was not apparently operative in the adjoining workhouse.

On inquiry at St. George-in-the-East Infirmary, I found that the only articles of diet which were practically common to all patients therein were water, milk, and bread. Of these the *water*, which is obtained from the mains of the East London Water Company, is used not only in the Infirmary but in the Workhouse as well. The same statement holds good with regard to the *bread*, of which sufficient is made and baked in the Workhouse for the use of inmates and staff of both portions of the institution. Milk, however, although contained in the dietary of all patients in the Infirmary, finds no place, with the exception of a very small quantity given in tea, in that of the Workhouse inmates. For this reason I turned my attention chiefly to the source, amount, and quality of the milk which had been supplied to this Infirmary for such time prior to the appearance of the first cases as would afford an ample allowance for an antecedent period of incubation of the disease. At my request the contracts for milk supply to the institution for the past two years were produced. On looking over them with the steward I was not a *little* interested to find that on July 1st, 1894,* about a week previous to the appearance in the Infirmary of the first cases of the epidemic disease, not only had a change in the contract been made for the first time for a year and a half, but also that the contract newly accepted was that of Messrs. A——, a firm of purveyors to whom I have referred as *having* supplied milk to certain other institutions in which I had *had occasion* to investigate the circumstances of previously occurring outbreaks of epidemic skin disease.

The Medical Superintendent informed me that from the first day on which the new milk supply come into operation he had noticed that it was of obviously inferior quality to that which *had previously been* in use. But although the amount of cream was estimated daily, no detailed chemical analysis appears to have been carried out, even though, by a process of exclusion, Dr. Bowlan, soon after the appearance of the first cases of the disease in the Infirmary, arrived, as he informed me, at the conclusion that the milk supply must have some causal relationship to the disease which had attacked in rapid succession so many of his patients.

So impressed indeed did he become with this conviction, that on August 13th, 1894, he caused Nestlé's condensed milk to be substituted in the Infirmary for the milk which was then being supplied by Messrs. A——. About three weeks later, namely, on September 9th, 1894, with the consent of the Guardians, Nestlé's milk was taken exclusively into use for the whole institution. This further change was adopted for the reason that several officials of the Workhouse staff who, unlike the inmates, had been in receipt of a daily allowance of Messrs. A——'s milk of greater or less amount, had become attacked by the prevalent disease.

As further evidence of the part probably played by ingestion of the suspected milk in the causation of the skin disease at this particular institution, may be mentioned the fact that within a week of such milk supply being stopped the number of cases of disease commenced to abate.

A much smaller secondary rise occurred in this institution in the number of attacks during the week ending September 15th, 1894, after which, as is seen by reference to the chart appended to this report, the numbers in each instance again fell below normal.

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* I have since learnt that the new supply actually commenced on June 29th.

Such marked rise and subsequent fall in the number of persons attacked, practically corresponding with the commencing use and withdrawal respectively of a particular milk supply, is of much interest, and can, I think, hardly be explained except on the theory that the disease had in reality some causal relationship with exceptional condition of the milk supply, the exact nature of which remains at present undetermined, but which has hitherto been observed to be for the most part a concomitant of a bad quality of milk.

At Marylebone Infirmary, with the object apparently of testing the value of the "milk" theory, the ordinary contract milk was eliminated from the dietary of *certain of the patients only*, but curiously enough, the patients selected were those who had already become attacked with epidemic skin disease; milk was *not*, as might be inferred from a statement appearing in one of the medical periodicals, eliminated from the Infirmary diets altogether. Indeed the medical officers of the institution (where by the way, as I have already stated, I was unable to gather any evidence implicating the milk supply) do not appear to have fully appreciated the point at issue, and as a matter of fact, the disease *went on spreading* in the infirmary. I was also told that no apparent alteration in the progress of the disease was obvious in those particular patients who had been put on Nestlé's milk in place of the ordinary supply. Supposing that milk had indeed been in this Institution the carrier of infection, it is obvious that such change, limited as it was to a few persons already attacked, could have exerted no influence on the progress of the epidemic. The experience therefore of the Marylebone Infirmary in the matter of milk cannot be held to in any way neutralise the apparently positive evidence to be derived from the history of the epidemic at Bethnal Green, Shoreditch, and St. George-in-the-East Infirmaries.

Although the use of Nestlé's condensed milk has now been discontinued at the St. George-in-the-East Infirmary, the milk contract, which existed at the time of the commencement of the recent epidemic, has been determined by the Guardians. The same statement holds good with reference to the milk contracts in the case of the Bethnal Green and Shoreditch Infirmaries, the firm of contractors being the same in each instance. These facts show that at any rate much good has resulted from the attention which has been directed to the poor quality of much of the milk supplied to the Metropolitan Poor Law Infirmaries, even though the thesis as to a possible causal relationship between such milk supplies and the appearance in certain of these institutions of outbreak of epidemic skin disease, may not be considered to be capable of demonstration.

2. *Personal Infection.*—Reference has already been made to the fact that those epidemics in which the milk supply fell under suspicion as having played a part in the causation of the malady, differed in some notable particulars from others in which such was not the case. In this latter category may be included the more recent outbreaks at the City of London and the Marylebone Infirmaries.

With reference to the City of London Infirmary it is at any rate a curious coincidence that the first person to be attacked during 1894 was, at the time of onset of the disease, sleeping not only in the same ward, but actually in the same bed, that had been occupied by the patient who had been the first to suffer attack in the previous year. The majority of subsequent cases which broke out, not only at this institution, but at the Marylebone Infirmary also, occurred, for the most part, in wards which had been invaded during the previous year, and this notwithstanding that some of the wards had, at any rate, been submitted to

some process of disinfection during the interval of freedom from the disease.

Whether or not such occurrences can be taken as affording evidence of the retention of infectivity in these particular wards it is difficult to say, but the fact is worthy of record, particularly in connexion with circumstances which appear not inconsistent with a belief that the disease under consideration is of a more or less infectious nature.

This question of infectiousness I have already discussed in my report on the outbreak of 1893 in the Bethnal Green Infirmary. In this place, therefore, I need only add that in one marked instance already mentioned, that, namely, of a porter at the Marylebone Infirmary, who contracted the disease subsequent to having temporarily been put on duty in the bath-room, and who consequently came into close contact with a number of cases admitted with the disease upon them, it appears highly *probable* that his attack was brought about by personal infection from one or other of the subjects of the disease with whom he had come in contact.

The recent outbreak at the Marylebone Infirmary is peculiar also for the reason that a number of the cases included in the tables appended to this report, were, when admitted (in many instances *from the workhouse*) actually suffering from the disease and may therefore have been the means of spreading the disease throughout the *institution*. This was so in a marked degree on the female side, where, *out of a total* of 26 cases, no less than 12 were transferred to the Infirmary from the Workhouse because they had become attacked by the disease in question. Thus of the first eight women who came under treatment for the disease in the Infirmary, six were admitted there from the *Workhouse, the* admissions dating from June 12th, 1894.

The first case, however, to arise in the Infirmary in 1894 was one on the male side, the patient being a man who had been admitted there more than a couple of months previous to the appearance of the disease. He was, at the time of his attack (June 1st, 1894) in Ward *H. 3, in* which there had been several cases during the previous year, and on making inquiry into the matter I learnt that this particular ward of the Infirmary had not been thoroughly disinfected in the interval, as had others in which former cases had been treated.

Neither of the next two patients on the male side contracted the disease in the Infirmary. One was admitted from outside on June 8th, while the other was transferred from the Workhouse about a fortnight later. Both were suffering from the disease at the time of their admission to the institution.

In all, 41 cases were treated on the male side of the *institution*, of whom all except five apparently contracted the disease subsequent to their admission. The outbreak extended over a period of about four months, the cases cropping up at more or less irregular intervals between June 1st and September 22nd, the greater number (23 out of a total of 41) occurring during the month of August.

All the cases treated at the Marylebone Infirmary during this period of time were of a comparatively mild type, and there occurred among them no such general elevation of temperature as was observed among the patients during the epidemic at St. George-in-the-East Infirmary. Of the eight deaths which occurred in this institution among patients suffering from the disease, the Medical Superintendent does not apparently consider that in any instance was the epidemic skin disease the sole or even the chief cause of the fatal result.

3. *Relapses.*—Not only in the outbreaks at present under consideration, but in former years also, a certain number of cases presented themselves concerning which there has appeared reason for believing that they had

on one or more previous occasions suffered from similar attack. Relapses at interval of a few weeks from the primary attack have been put on record in a large number of cases since attention was, a few years ago, first directed in this country to the peculiar and special features of the disease, but it is not unlikely that the true nature of attacks, separated by periods extending backwards over months and years, has hitherto passed unrecognised in many instances.

The admission to an Infirmary of such cases during an interval of freedom from the disease, and its re-appearance during their stay in the institution, might, supposing the disease to be of an infectious nature, well account for its subsequent appearance in one or more instances, without any cause for its outbreak being obvious.

The possibility of relapses of this malady after considerable intervals of time is supported by the experience of observers both on the Continent and in America; and during the recent outbreaks I have been assured by several patients that they had suffered on one or more previous occasions from attacks, exactly similar, as far as they could judge, to that for which, at the time of making such statement, they were under treatment. Although, as far as I am aware, no English observer has up to the present, called attention to this peculiarity of the disease, it will I think be admitted that patients could hardly be mistaken in their account of such marked symptoms as a general skin-rash, accompanied often by intolerable itching, preceded usually by general malaise and followed by profuse desquamation.

Further, if the recent experience at St. George-in-the-East Infirmary may be taken as a criterion, the malady does not by any means exhibit one universal type, and consequently it is all the more likely that outbreaks may on occasion have been brought about by the treatment in an institution, among numbers of persons susceptible by reason of age and debilitated system, of a patient suffering from the disease in unrecognisable form.

It would indeed appear not unlikely that the skin-rash, if one of the most frequent, is not an absolutely essential concomitant of the general constitutional disturbance, and *vice versâ*; and that, like influenza, the disease may exhibit in excess, now one, now another, of various symptoms pertaining to it, even within the compass of a single outbreak. It would also appear to resemble in certain respects such diseases as malaria and syphilis, in that its hold on the system may apparently persist, with only occasional manifestations, for an indefinite period.

December 1894. S. Monckton Copeman.

Preliminary Note on Observations on the Pathology of "Epidemic Eczema" during the Year 1894, by Frederick W. Andrewes, M.B., M.R.C.P.

Dr. Andrewe's Report.

I was considerably hampered in my work on this subject in 1893 by difficulty of obtaining suitable material. This year this has not been the case; by help of the Medical Superintendents of the Shoreditch, St. Marylebone, and Kensington Infirmaries, I have been able to make a number of observations on acute cases of the disease, and in some cases I have been fortunate enough to secure ample material from post-mortem examination of persons in whom attacks had proved fatal. The microscopic examination of much of this material I have not yet had time to complete, and I propose here to summarise only the bacteriological side of my observations.

In my previous report I was compelled to arrive at the conclusion that there was no evidence of the constant presence of any one specific

micro-organism in cases of the disease, and I was inclined to believe that this was owing to lack of suitable material on which to work. This year I have examined 13 acute cases—some of them more than once—by improved methods suggested by wider experience; but I have to record an equally negative result.

The methods employed consisted in microscopic and cultural examination of the blood from acute cases, and of fragments of skin, excised in all instances with the patient's consent, from the seat of disease at a very early period, sometimes within one or two days from the first appearance of the eruption. It is on observations of the latter kind that special stress should in my opinion be laid, inasmuch as the constitutional disturbance seems to bear some relation to the extent and severity of the skin affection; whence one may reasonably assume that, if the disease be due to a specific micro-organism, it is in the affected skin that it is most likely to be found. Fearing that my negative results might be due to the use of too powerful antiseptics in sterilising the skin, I have abandoned the use of perchloride of mercury and carbolic acid, and contented myself with thorough washing with soap and water, followed by cleansing with absolute alcohol, which was allowed to dry up before the fragment of skin was excised.

In seven acute cases skin fragments were excised, after surface sterilisation, from the actual seat of the disease; in another case large pieces of skin were, immediately after death, excised from an acute fatal case. Cultures were made immediately—on various nutrient media in all these cases; details will be given later in my complete report. The results were that in five out of the eight cases the cultures remained absolutely sterile; in one case in which the skin had been imperfectly sterilised several species of staphylococci grew; in two others, a white and a yellow staphylococcus grew respectively, the number of colonies being very small.

In eight cases cultures were made from the blood. In five of these the cultures remained quite sterile; in the other three—one or two species of cocci grew.

In three cases I had the opportunity of being present at post-mortem examinations of fatal cases of the disease, but in two of them 48 hours had elapsed since death, and so many putrefactive organisms were present that no satisfactory results could be obtained, though it is noteworthy that cultures from an enlarged femoral lymphatic gland in one of these cases remained sterile. The third case was an exceedingly favourable one—as death occurred on the eighth day from septicæmia—the rash being fully out at the time. I was able to excise pieces of skin within twenty minutes of death, and the post-mortem examination was made at the earliest opportunity after death. Here, however, the skin cultures remained absolutely sterile, and cultures from the heart blood and spleen yielded some four species of staphylococcus, together with a few contaminations derived probably from the air of the post-mortem room.

The last observation which I have made consisted in inserting beneath the skin of a rabbit's ear a fragment of skin excised from a mild but recent case of epidemic eczema. The wound healed at once, and after the lapse of two to three weeks a slight scaliness of the skin appeared in its neighbourhood, while towards the base of the ear a definite eczematous patch appeared. This, however, vanished after about a week, and attempts to inoculate other rabbits have been so far unsuccessful.

I would add that, so far as my own observations have gone, I am not satisfied as to the infectiousness of the malady. This one experiment on the rabbit affords the solitary instance which has fallen under my

own observation, in which the disease appeared experimentally communicable, and I do not wish to lay much stress on a single experiment in which the result was at least equivocal.

The conclusion which I have reached as the result of the bacteriological examination of cases of the disease, during the present year, thus confirms, from fuller data, that which I reached in my previous report. I can find, in the majority of acute cases, no organisms present either in the blood or in the affected skin; where micro-organisms have been found they have been of no constant species, but have included various sorts of staphylococci—some of which at least are normal inhabitants of the human skin, while others which I have tested have no pathogenic powers as regards rodents. Two possibilities suggest themselves. If the disease be truly infectious it may be due, as in the case of certain specific fevers, to a micro-organism which cannot be stained by any of the methods in general use, or grown artificially on any of the cultural media at our command. Or, in the second place, although epidemic, it may not be infectious, and may depend not on any micro-organism at all, but on some chemical poison present in food, or in some way introduced into the body of inmates of certain workhouses and infirmaries at certain times of the year. Analogy with allied skin affections, such as ordinary eczema, of the microbic origin of which we have no valid evidence, would suggest, perhaps, the latter view, and accordingly it would be satisfactory to obtain more convincing evidence of the communicable nature of the disease before we commit ourselves to a belief in its bacterial origin.

ADDENDUM A.

Letter from Dr. Bowlan, Medical Superintendent, St. George-in-the-East Infirmary, with reference to the Diagnosis of Anomalous Cases of Epidemic Disease.

Infirmary, St. George-in-the-East, London, E.,
November 3rd, 1894.

Dear Sir,

I enclose some brief and very imperfect notes of a few more cases which I think bear upon the question of the presence or not of influenza as a factor in the epidemic of skin disease, &c., here.

(1.) The main objection to the influenza theory has always appeared to me to be the prevalence of vomiting or diarrhœa, or both combined, in so many of our cases. For these symptoms are clearly neither common in, nor typical of, influenza.

Of the 126 cases—

126 {
- 67, gastric or enteric symptoms or both. {
  - 48, or 38·0 per cent., vomited.
  - 8, or 6·35 per cent., had diarrhœa.
  - 11, or 8·7 per cent., had *both* vomiting and diarrhœa.
  - 67, or 53·0 per cent., had either vomiting or diarrhœa or both.
- 59, no alimentary sign of enteric fever or diarrhœa.

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In fact, the vomiting was so prevalent, that I began to suspect irritant poisoning, and tested the beef tea and broth for copper (being cooked in copper), but found no trace of such metal.

The milk then (which had always been viewed with suspicion from when the contract changed on June 29th) was then regarded as the cause.

(2.) And taking the view that the great improvement which followed the use of condensed milk on and from August 13th was due to this change in the dietary I do not see how the influenza theory can be held, excepting on the ground of coincidence, and this I think the vomiting and urticaria disposes of.

(3.) Again, the cases without rash were not all febrile (*vide* cases 3, 4, 5), and yet in most of these cases vomiting was present, thus excluding the possibility of this symptom being simply the reflex of a medulla disordered by blood at a febrile heat, or, in other words, a part of a "general malaise."

(4.) Again, in some cases the "rash" only appeared late (*vide* cases 2 and 5), and was often only very trivial and slight, thus suggesting that the more serious early vomiting (or anorexia or fever) really represented the full initial force of the microbe and its toxins, which had either thus exhausted themselves or had rendered the tissues immune. For if it were a totally different disease one would expect that the skin disease following after would be aggravated and not mitigated.

(5.) Again, these late rashes were often represented by a dry and desquamating condition of the skin (case 2), and in such a case it is reasonable to suppose that the primary state had abated and that the primary illness was the same disease.

(6.) Again, some of the cases might have shown the rash had they lived longer. For some few only survived a few days.

Vide cases of—

Isaac B., attacked 27th July, died 30th July.
Hannah K., attacked 28th July, died 31st July.
Daniel D., attacked 21st July, died 30th July, &c.

(7.) A hæmorrhagic tendency existed in common in *both class of cases*. Of course hæmaturia, &c., is described in influenza, but I take it that most people have found it to be very rare.

Thus—

O * Bridget D., 32. Vomit streaked with blood.
O. David B., 61. Slight hæmoptysis, with a temperature of 103° F. Vomiting and diarrhœa.
O. Hanial D., 47. Profuse epistaxis.
O. Margaret A., 80. Hæmaturia.
O. Eliza R., 67. Hæmaturia.
R.†John D., 32. Hæmoptysis and slight hæmatemesis.
R. Joseph W., 54. Epistaxis.
O. Hannah C., 27. Diarrhœa (bloody febrile). Is pregnant, and has piles.
O. Amelia W., 58. Hæmorrhage from rectum.
O. John H., 48. Diarrhœa and melæna.
R. Robert F., 61. Several attacks of vomiting with slight hæmatemesis.

In addition, petechiæ and similar blood extravasations in the skin occurred in some cases.

(8.) It has been stated by Dr. Savill that the temperature was never elevated in his cases unless in the presence of "boils" and such like local processes. But the chart of C., No. 1, shows that a high temperature may accompany the rash without any boils. For Catherine C., even supposing she had influenza, had no pulmonary complications, and her temperature could hardly have been elevated for so long a period, except by the presence of the cutaneous affection, which was clearly a general exfoliating dermatitis. And the possibility of influenza having influenced the type of the skin disease, *e.g.*, that a true influenza rash should accompany and modify the other dermatitis is, I think, more theoretical and open to doubt than the proposition that we have one disease to deal with, although somewhat protean in character.

Again, I enclose chart, Case 6, which is that of Pard S., who was attacked three weeks after her confinement. This woman did not appear to have headache or other influenzal symptoms.

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* O = No rash. † R = Rash.

She always looked and appeared comfortable. Unfortunately, she could not speak English.

She at no time suffered from *boils*, yet she had a considerable elevation of temperatures; so that I consider Dr. Savill's *ex cathedra* statement on this point is decidedly hasty and wrong.

Her child, on the other hand, who had a very marked attack of the "dry" type of the disease, had no fever.

(Compare Cases 7 and 8.)

Dr. Savill states, too, in his book that some of his nurses had observed influenza-like symptoms at Paddington, which he apparently discredited and ignored.

I have not been able to fix any definite time from onset to appearance of rash. But in several cases this has been from 12 to 16 days, 13 or 14 days being the most frequent.

On the other hand, these were in many cases apparently simultaneous.

Trusting that these rough notes may, at any rate, be of some slight use to you,

I beg to remain, &c.

Dr. Copeman. (Signed) Marcus M. Bowlan.

ADDENDUM B.

ST. GEORGE-IN-THE-EAST INFIRMARY.

Case 1.

Name: Catherine C——, aged 36.
Admitted: June 19th, 1894.

Has been in Infirmary on several occasions with lead colic, sickness, and anæmia. Always made a good recovery.

On June 19th, 1894, she was again admitted as a case of plumbism. She stated that she had been working on odd days at the white-lead works.

She complained of abdominal pain, but there was no acute colic. Appetite poor. Does not sleep well. She is stout, but anæmic. There is a faint "gum line."

Heart, normal. Lungs, normal.

Urine, sp. gr., 1·019, acid. No albumen.

She was put on saline aperient mixture.

She gradually improved and her temperature was always normal.

On June 26th she was put on No. 1 (full) diet, and a ferruginous tonic and aperient was prescribed. She had progressed very satisfactorily, and was able to be up all day. She assisted in the ward work and was practically quite well until July 24th, when her appetite failed and she requested that she might be put on No. 3 diet. Otherwise she was quite well and went about as usual.

Late on the evening of the 28th July, however, she was attacked with *diarrhœa* and *vomiting* (is on aperient medicine). Her temperature was slightly febrile, 100·2°. "La grippe" was provisionally diagnosed and she was ordered a saline mixture.

The next day (July 29th) patient was decidedly ill. The face was flushed and the tongue covered with yellowish fur. She complained of headache, back-ache, and general malaise. There was no evidence of rheumatism though she complained of pains in her limbs. The throat was normal. She was given a mixture of antypyrin and quinine at 11 p.m.

Patient continued thus in a febrile and prostrate condition with no appetite, a dirty furred tongue, headache, and general soreness, &c., until the 11th August, when her face became swollen and erythematous (but no œdema), and a rötheln-like rash appeared over the body and limbs. On the arms and forearms, however, there were in addition *large whealy collections of papules* which gave rise to a good deal of itching. No vomiting.

On August 12th she was ordered Nestlé's milk (urgent) and ordinary milk was cut out of her dietary altogether.

August 13th. Feels much better. Rash still present. August 16. Inunction with Ol. Eucalyptus began as the rash still persists. August 17th. Felt sick but did not vomit. August 18th. Very thirsty and prostrate. Bowels constipated. August 19th. The rash has almost disappeared from body. But the papular condition on arms and forearms is still marked though showing signs of exfoliating. Urine, sp. gr., 1·020, acid; no albumen.

August 21st. The face and eyelids and forehead are now desquamating. The forearms slightly so. The body is covered by fine brawny scales. Lips very dry and cracked. Tongue moist. August 24th. Patient very much better since last note; bowels relaxed (mixture). Flakey desquamation on face, ear, and scalp. Hair coming out freely. Eylids are puffy. Desquamation is now progressing rapidly *all over* the body. Those parts on forearms, &c., where there had been large whealy groups of papules now show a peculiar dark yellow pigmentation of the epidermis, raised above the surrounding skin. Her scalp is almost bald, all hair in the axilla has been shed, and the surface of the nails is rough and yellowish.

September 10th. The skin is now quite clear excepting on the front of the wrists, where there is still some thickened yellow epidermis which has not separated. (*See* Chart No. 5.)

Case 2.

Name: Bridget K——, aged 38.
Admitted: July 18th, 1894.

A pale, anæmic, but well nourished, muscular, woman, who, on admission, complained of abdominal pain.

There was a blue line on the gums. Abdomen not tender, and patient did not appear to be in any acute pain. No abdominal retraction or distention.

She vomited several times a greenish-coloured fluid, and continued to vomit at intervals until the 23rd July. When there was no sickness patient was much better.

By July 31st she was practically well again. Patient got up and about ward and kept well till August 5th, when she complained of pains all over, was flushed and febrile.

For some days she continued indisposed and with complete anorexia, but had no further attacks of vomiting.

However, on August 13th, about 7 a.m., she became suddenly giddy and faint on getting out of bed, and fell in the ward. (No head injury.) By 10 a.m. she was very collapsed and dazed, and had a rapid running pulse, and was very restless. Her pupils were equal, but *very widely* dilated, and did not re-act to light.

Patient vomited several times during the day, and was in a state of semi-coma, *i.e.*, unconscious, yet restless. Passed urine; bowels open. Did not vomit during night, and slept at intervals.

On August 14th she was rather restless during afternoon and evening. She had not spoken since 7 a.m. on the 13th instant. There was great difficulty in swallowing, and she was taking little food. At night she was very restless and vomited frequently a dark greenish fluid. She passed no urine during the night.

August 15th. Restless at times, but not so unconscious. She spoke several times during the day.

Vomited several times. Had morphine injection.

A small patch of herpes appeared at the right angle of the mouth.

Very restless at night; did not sleep, and vomited frequently. Passed no urine. Temperature, 97°. Bowels not open. Very delirious at times. Tongue becoming dry and breath foul.

August 17th. Still very restless and delirious. Slept well during the night. Not sick.

By August 18th, she had become a little better, and much quieter; excepting the herpes there has been no evidence of any rash.

But on September 9th there was noticed to be slight desquamation on the middle of the forehead, about the mouth and chin, and at the seat of

the herpes rash. Her hair did not come out. Whether this scaly condition of forehead was simply "physiological" or not is a moot point. The rest of her body remained quite free from desquamation.

Discharged cured and quite well September 28th, 1894. (*See* Chart No. 6.)

Case 3.

Name: Martha T——, age 58.
Transferred from the Workhouse.

She had been in Workhouse since May 31st, 1881.

Had suffered at times from chronic bronchitis, but had never had any skin disease in her life. Her illness began on Friday, August 24th, 1894, when she noticed a rash on her arm, which itched, but she made no complaint to anyone. The next day she felt cold and chilly, and had headache.

She was admitted to Infirmary, Sunday, August 26th. Her face was then very flushed and ruddy. Febrile, feeble, pulse quick and weak. Tongue dry and breath very foul. Very thirsty. No valvular disease, but heart's action very feeble.

There was an eruption on the arms and forearms, on the chest, and about the shoulders, buttocks, legs, thighs, and feet, consisting of fine papules which did not feel "shotty."

Nestlé's condensed milk was ordered in place of the contract supply.

August 27th, tongue very dry. Pulse very feeble. No. sputa. Breath offensive. Ordered brandy daily. Bowels not open.

On August 28th, the tongue was rather better, and her condition generally had improved. As she was very thirsty, lemon juice and soda water was ordered. August 29th. Much better. Breath not nearly so foul. The rash which has been of the dry type is gradually becoming less marked. September 7th. The papules are now giving place all over the body to a fine desquamation. But there are still some distinct yellowish papules about the dorsum of the foot.

The skin was treated at first with zinc oxide and salicylic acid "cream," and afterwards Ung. Eucalypti P.B. was used.

September 27th. The skin is now quite well and normal again. But patient is very feeble and remains under treatment for chronic bronchitis. On a morphine mixture being discontinued (27th September) she vomited a good deal, and morphia had to be again (October 1st) prescribed, since which there has been no sickness. (*See* Chart No. 7.)

Case 4.

Name: Hannah G——, aged 30.
Admitted: 20th July 1894.

Was "confined" some months ago, following on which she had an attack of mania of a hysteroid character. She is decidedly weak-minded, but not a lunatic. She had been an inmate of Infirmary as a case of "debility," bodily and mental, since July 20th, 1894. Her general health quite satisfactory, though a feeble woman. Had not suffered from sickness. Temperature, normal. Is not epileptic.

On August 20th, at 4 p.m., she was attacked with clonic spasms in the face and neck. Speech failed her. Neither arm nor leg affected. Pupils equal and re-act to light.

She was found to be in a semi-conscious condition, but there was no paralysis; pulse quick and feeble; temperature 99.6°. Speech returned in a few minutes, but she could not converse, as her mind was in a "confused" condition. About 5 p.m. she vomited. She vomited again twice during the night, a quantity of a greenish fluid.

On August 21st, as she was still vomiting frequently, she was ordered a bismuth and morphine mixture.

Four days later right hemiplegia and aphasia developed during the night, and she had an epileptiform fit at noon on the following day.

At this time also she was found to be perspiring freely, and three irregular small vesicles were noticed on the back of the right wrist.

On August 26th there were epileptiform clonic spasms of the right side, forearm, and hand. There was no conjugate deviation of eyes. The patient was semi-conscious.

August 27th. Speech partially returned, but patient cannot converse.

August 28th. Still occasional convulsions on the right side. Right pupil dilated and larger than left.

August 30th. Improving.

Between September 1st and 4th she had several fits, since when she commenced to improve, and has had no further attack.

On September 6th she could utter words, but could not converse. There were apparently some signs of desquamation on the forehead and face.

On September 15th she suffered from considerable mental excitement, and had to be put in a padded room, but by September 17th she had become quiet and was apparently quite well again in all respects.

(Dr. Savill had a case in which paralysis occurred and the patient died.)

In the present case the condition appeared to be functional and like post-epileptic paralysis. The patient, previous to this illness, had never had an epileptic fit. At one period of her illness there was some rise of temperature. She has had no fit since, and is now well (November 3rd). (*See* Chart No. 8.)

Case 5.

Name: John W——, aged 45.
Admitted: 25th October 1893.

An anæmic, stout man, admitted for fracture at the ankle joint, but quite well in health.

Towards end of July 1894 he complained of having absolutely no appetite, and he looked depressed and unwell. Temperature, normal. Urine, sp. gr., 1·020, acid. No albumen.

A fortnight later, on August 13th, the skin and face appeared somewhat dryish. He remained in a lethargic state, taking very little nourishment, and his breath had an offensive odour.

On September 14th a papular petechial rash, consisting of about a dozen scattered papules, appeared on the forearms. His tongue became dry and raw looking.

Three days afterwards there were petechiæ on the arms and legs, and the skin over the back and chest was desquamating in dry brawny scales. Patient had also slight chronic bronchitis.

On September 20th he became very sick and vomited frequently. This was followed by great weakness and prostration. Ordered bismuth and morphine mixture.

The urine, when examined, two days later, was of sp. gr., 1·018, acid, and showed a deposit of urates, but no albumen.

He died September 26th, 1894, from—1, epidemic skin disease; 2, congestion of lungs; 3, cardiac failure.

Case 6.

Name: Charles J——, aged 49.
Admitted: 23rd August 1893.

This man who was a patient under treatment for chronic gout, was comparatively well until the middle of July, when he became ill with complete anorexia, was depressed and his hair came out so that in the space of two weeks he became almost bald. There was no fever, neither was there any skin rash.

On July 30th diarrhœa set in; he gradually became weaker, and he died on August 5th.

Case 7.

Name: Henry H——, aged 68.
Admitted: 27th May 1894.

This patient was under treatment for an ulcerated leg, and had otherwise been perfectly well till the night of August 6th, 1894, when he vomited

and had an attack of diarrhœa. His temperature was at this time 98° Fahr.

Next day he was practically well again; was not sick, and had no diarrhœa. He continued well and taking full diet till August 13th, when he again vomited and became very collapsed. He had an obstinate attack of hiccough, and "congestion of the lungs" supervening, he died at 2.30 p.m. on August 14th. There was never any rash.

Case 8.

Name: George C——, aged 52.
Admitted: 31st July 1894.

This patient was in good general health till August 6th, 1894, when he was attacked with vomiting without any apparent cause. He continued to vomit all his meals and could not even retain milk. Temperature, normal.

On August 12th he was put on Nestlé's milk instead of ordinary milk. He vomited, however, in the evening, and twice on August 15th.

After this he was not again sick, and got apparently quite well again.

On September 5th, however, petechial spots were noticed on the legs, but there was no sign of desquamation anywhere. There had never been any positive rash.

Cases 9 *and* 10.

Name: Elizabeth R——, aged 33, and her baby aged six weeks.
Transferred from the Workhouse.

The mother had a rigor on September 13th, 1894, and complained of pains "all over." Had headache (frontal) and back-ache. She did not vomit nor feel sick. Her forehead was distinctly scaly and desquamating, but the rest of her body was free. She had a dirty tongue and looked flushed and ill.

Her temperature on September 14th, at 3 p.m., was 102·2° F.; at 7 p.m., 99·8° F.; and at 10 a.m., on September 15th, was 98·8° F.

The temperature was not taken when she had the rigor on September 13th, as she made no complaint at the time.

By October 11th her forehead was normal again.

Her child.—On September 14th her child, which was at the breast, was found to have a fine, discrete, papular, horny rash on the neck, about the shoulders, on both arms, and to a slight extent on the legs. The body was almost entirely free. The temperature was normal.

Desquamation followed, and the skin was quite free by October 11th. The case was treated with zinc and salicylic cream.

"Is it probable," says Dr. Bowlan, "that the mother and child in this "instance were suffering from two different diseases? I think there can "be no reasonable doubt but that both of them had a mild attack of "epidemic 'skin disease,' but of somewhat different types."

(*Copy.*)

West Ham Workhouse,
Leytonstone, E.
September 28th, 1894.

Sir,

I wish to make the following report to the Local Government Board, as to the epidemic of skin disease at present prevalent in this Workhouse.

There are 42 cases of an unusual form of skin disease under treatment.

28 are females, 14 are males; these patients are in separate wards, no other patients mixing with them.

They are nearly all of an advanced age, 6 men and 14 women being over 70; 3 men and 8 women over 60; 8 were admitted from the body of the Workhouse, 2 from outside, the rest were already in the Infirmary for other diseases.

In five cases deaths have occurred, undoubtedly accelerated by this disease.

1. A man who had gout for years, who became affected on the 22nd June, and died on the 15th August 1894.

2. An old man, 83 years of age, quite well, until attacked on the 10th July. He became demented, and died on the 8th August 1894.

3. A man, 63 years old, had hemiplegia for years; he had cellulitis of the leg on the 28th February, which got well. On the 15th May, dermatitis occurred, after which he became demented, and died 27th July 1894.

4. R—, M. (87), a case of chronic bronchitis, became dangerously ill when attacked on the 20th September. He died on the 23rd.

5. P——, John (78), a case of senile dementia, paralysed, and bedridden. He was attacked with dermatitis and died 18th September 1894.

Altogether, there have been 128 cases; of which 11 have left the house cured. Nine have died (that is, 4 in addition to those above-mentioned), but in these cases I do not consider that dermatitis had anything to do with the deaths, which occurred after they were fairly recovered, the actual causes being (1) senile gangrene; (2) cerebral softening; (3) apoplexy; (4) bronchitis; their ages being respectively 77, 67, 88, and 73. There are, thus, 110 persons now in the institution who have or have had the disease, 42 of whom are still suffering. The greater number are almost well; 6 women and 3 men, however, are very bad, one of the latter having bronchitis.

With regard to milk being the alleged cause, the following figures may be instructive.

There are 739 persons under medical treatment in the Infirmary, more than half, or 372, have milk daily; 82 have been attacked, about 22·04 per cent.

On the other hand, 367 have no milk, or only a small portion with their tea, 28 or 7·63 have been affected.

This great difference may be explained by the fact that, with very few exceptions, the victims of this disease are among the aged and weak, who naturally form the large majority of those on milk.

For instance, out of the 110, 28 were below 60, whilst 41 were actually above 70.

Again, many cases developed in the body of the house and were transferred to the Infirmary. In the house these people would have a meat diet, and on being attacked were put on a milk diet with no bad result.

The milk supplied to the inmates is all boiled. The milk supplied to nearly 100 officers is not boiled, and is exactly the same, but only two of the latter have suffered slightly.

With regard to infection or contagion.

Two newly born infants were attacked with a similar eruption; in one case the child was "on the bottle," but nursed by, and sleeping with, his mother, who did not contract the disease. The other was actually suckling, but his mother also remained free.

A woman with a nine months old child became affected. She was partially suckling her infant, who also had milk, but is perfectly free from disease of any sort.

A woman, aged 45, was successfully operated on for strangulated hernia, and the wound was almost healed when she became affected with dermatitis, which spread from the wound in an erysipelatous manner over the whole body, face, and limbs; she ultimately got quite well and had no rise of temperature.

There have been no fresh cases now for some days, and the others are progressing favourably.

I am, &c.

(Signed) Ernest Vallance,
Assistant Medical Officer.

W. E. Knollys, Esq.,
Assistant Secretary,
Local Government Board.

ADDENDUM C.

St. George-in-the-East Infirmary.

Table showing the Number of Persons and of Cases of Epidemic Skin Disease at each of Certain Age Periods in the Infirmary during July, August, and September 1894.

Ages.	1 to 9.		10 to 19.		20 to 29.		30 to 39.		40 to 49.		50 to 59.		60 to 69.		70 to 79.		80 to 89.		Totals of all Ages.	
	M.	F.	M.	F.	M.	F.	M.	F	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Number of persons under treatment in Infirmary at each age - -	58	55	8	17	26	43	32	50	67	37	38	43	64	65	27	62	4	17	324	389
Number of persons affected with the epidemic skin disease - - -	2	4	0	1	1	3	6	7	11	7	6	7	10	7	4	6	1	1	41	43
Ratio of cases of the disease to inmates of Infirmary at each age; per cent. -	3·45	7·28	0·00	5·88	3·85	6·99	18·60	14·00	16·4	18·95	15·8	16·3	15·65	10·79	14·85	9·69	25·00	5·89	12·65	11·05
Proportion attacked in both sexes combined; per cent. - - -	5·30		4·00		5·8		15·8		17·3		16·05		13·18		11·25		9·5		11·7	

This table is based on the number of separate individuals who passed through the Infirmary during July, August, and September. The cases of skin disease are those which occurred in the Infirmary only. The Infirmary officers are not included either among "inmates" or among cases of skin disease.

ADDENDUM D.

PARTICULARS as to CASES of EPIDEMIC SKIN DISEASE occurring in the ST. GEORGE-IN-THE-EAST INFIRMARY.

R= Rash. O= without Rash.	Name.	Age.	Sex.	No. of Ward in which Patient was at Date of Attack. I.=Infirmary. W.=Workhouse.	Date of Admission to Infirmary.	Date of Appearance of Eruption or of other Symptoms if no Rash.	Date of Removal to other Ward, with No. of Ward to which removed.	Diet of Patient at Date of Attack, with Extras, if any.	Previous Malady from which Suffering.	General Condition of Patient prior to Attack.	Date of Recovery or Death.	If admitted with Disease, where from.	If occurring in Workhouse, Date of Admission to Workhouse.	Other Remarks, &c. + The plus sign opposite a Death indicates that the Epidemic was the direct cause of Death. − The minus sign that it was only an auxiliary cause.
R	S., Margt.	70	F.	I. C. 4 F.	16.3.94	1894. 3rd July	Sept. 1st to B.S.B.	No. 4	Right hemiplegia.	Feeble	1894. Still under treatment.			Rash only noted on Aug. 9th, then desquamating. The relapse was erythematous, and followed by large flakey scaling. Skin well again by Oct. 18th.
O	L., Rebecca	62	F.	I. B. 4	4.6.92	3rd „	Not isolated.	No. 1	Gout (quiescent).	Good health.	Recovery, 20th July.			July 3rd—Anorexia, severe headache. Vomited from July 9th to 13th. Not febrile.
O	L., M. A.	68	F.	I. C. 4 F.	27.6.94	5th „	„	No. 3	Ch. bronchitis, cardiac dilatation.	Feeble	+ Died 8th Aug.			Had influenza-like attack of pains all over, &c. Got congestion of the lungs and died. Prior to this was doing well.
R	P., Alfred	7	M.	I. D. 4	31.5.94	6th „	„	No. 4	Tubercular glands.	„	Recovery by Sept. 1st.			July—Vomiting, &c. Rash—urticarial and papular. Rash not till 15 Aug. 1894.
O	C., Wm.	46	M.	I. C. 4 M.	14.12.93	6th „	„	No. 3 eggs i.	Bronchial asthma.	Good	Recovery in a few weeks.			Had complete anorexia and foul dirty tongue.
R	W. House, Asst. Matron.	50	F.	W.	-	8th „	„	Officers'	None	„	End of Aug.			Began "rheumatism" and pains in head, &c. No appetite. Then beginning of August papular rash appeared.

R= Rash. O= without Rash.	Name.	Age.	Sex.	No. of Ward in which Patient was at Date of Attack. I—Infirmary. W=Workhouse.	Date of admission to Infirmary.	Date of Appearance of Eruption or of other Symptoms if no Rash.	Date of Removal to other Ward with No. of Ward to which removed.	Diet of Patient at Date of Attack, with Extras, if any.	Previous Malady from which suffering.	General Condition of Patient prior to Attack.	Date of Recovery or Death.	If admitted with Disease, where from.	If occurring in Workhouse, Date of Admission to Workhouse.	Other Remarks, &c. + The plus sign opposite a Death indicates that the Epidemic was the direct cause of Death. − The minus sign that it was only an auxiliary cause.
O	W., Annie	5/12	F.	I. C. I.	6.7.94	1894. 12th July	Not isolated.	4a	Dyspepsia	Feeble	1894. Recovery, 27th July.			Vomiting, diarrhœa. Febrile and bronchial catarrh and urticaria on 12th July.
O	S., Michael	7/12	M.	I. C. I.	17.3.94	12th „	„	4a	Malnutrition	Poor	Recovery, 1st Aug.			Vomiting and bronchial catarrh.
O	K., Rose	35	F.	I. B. 4	18.11.92	12th „	„	No. 4	Ch. rheumatism.	Anæmic.	Recovery, 20th July.			Febrile. Anorexia, tongue dryish. Breath foul.
O	B., Rebecca	5/12	F.	W. Nursery.	13.7.94	13th „	„	Infants'	None	Good	Recovery 1st Sept.		31.1.94	Both these children had bronchial catarrh, and vomited much, &c. Not febrile on admission. C. afterwards had general desquamation of the skin.
R	C., Edward	1	M.	W. Nursery.	13.7.94	13th „	Sept. 1st. B.S.B.	Infants'	„	„	Recovery, 22nd Oct.		15.6.94	
O	F., Wm.	71	M.	I. D. 4	11.6.92	13th „	Not isolated.	No. 1	Senile cataract (operated and cured).	„	Recovery in a few days.			Rash, chiefly urticaria, with a few papules about arms. He felt giddy and vomited.
O	D., Thos.	32	M.	I. A. 4	14.6.91	13th „	„	No. 1	Old spinal injury and paraplegia.	„	Died 26th July.			Vomited slightly febrile, no appetite, tongue dry, breath foul.
	S., Catherine	68	F.	W. No. 41	14.7.94	14th „	„	W. H. II., milk, two pints extra.	Ch. bronchitis	Feeble	Died 16th Aug.		1.11.90	Had albuminuria, vomiting, suppression of urine, and cardiac failure.
	W., Mary	4	F.	I. C. I.	23.6.94	16th „	„	3a and Nestlé's milk.	"Head and ding," &c.	Fair	Recovery, 27th July.			with July last of M. Mary chronic catarrh, tracheitis &c.

R= Rash. O= without Rash.	Name.	Age.	Sex.	No. of Ward in which Patient was at Date of Attack. I=Infirmary. W=Workhouse.	Date of Admission to Infirmary.	Date of Appearance of Eruption or of other Symptoms if no Rash.	Date of Removal to other Ward, with No. of Ward to which removed.	Diet of Patient at Date of Attack, with Extras, if any.	Previous Malady from which suffering.	General Condition of Patient prior to Attack.	Date of Recovery or Death.	If admitted with Disease, where from.	If occurring in Workhouse, Date of Admission to Workhouse.	Other Remarks, &c. + The plus sign opposite a Death indicates that the Epidemic was the direct cause of Death. − The minus sign that it was only an auxiliary cause.
O	D., Bridget	32	F.	W. No. 41	16.7.94	1894. 16th July	Not isolated.	W. H. II.	Epilepsy	Good	1894. Recovery, 9th Aug.	- -	26.4.89	Was "fitty" and strange in manner. Febrile, 103° F. Bronchial catarrh. Vomited frequently, offensive vomit. No diarrhœa. Headache.
O	J., Chas.	49	M.	I. A. 4	23.8.93	16th „	„	No. 1	Gout (quiescent).	Rather feeble.	+ Died 5th Aug.	- -	- -	Anorexia and bodily debility and mental depression set in. He gradually got worse. His hair all came out. He became sick, had diarrhœa, and died.
R	S., Esther	9/12	F.	I. B. I.	1.7.94 (born).	19th „	July 20, B. 5.	No. 3a	New-born child.	Good	Recovery, 20th Sept.	- -	- -	Rash took dry type, and a tendency to *ringed form*.
R	S., Pard	27	F.	I. B. I.	1.7.94	20th „	Sept. 1, B.S.B.	No. 3	Labour	„	Recovery, 16th Sept.	- -	- -	Severe case of moist type, with slight fever, 102° F.
O	K., John	50	M.	I. C. 4 M.	20.6.94	20th „	Not isolated.	No. 3	Slight dementia.	„	Recovery, 25th Aug.	- -	- -	Complete anorexia with foul breath in man who generally ate ravenously. 31st Aug., forehead "scaly," but no positive rash.
O	B., David	61	M.	I. A. 4	7.7.94	20th „	„	No. 1	Quiescent, fibroid phthisis.	Fair	Recovery, 6th Aug.	- -	- -	Diarrhœa, vomiting, off food. Slight hæmoptysis.
O	D., Danl.	47	M.	I. D. 4	21.6.94	21st „	„	No. 3	Ulcered leg	Good	+ Died 30th July	- -	- -	Vomited 21st July 1894. Headache and severe epistaxis. He became febrile, very sick, and died rather suddenly. Epistaxis began 27th July 1894.

App. A. No. 11.

On an Outbreak of Epidemic Skin Disease (Dr. Crookshank).

R= Rash. O= without Rash.	Name.	Age.	Sex.	No. of Ward in which Patient was at Date of Attack. I= Infirmary. W= Workhouse.	Date of Admission to Infirmary.	Date of Appearance of Eruption or of other Symptoms if no Rash.	Date of Removal to other Ward, with No. of Ward to which removed.	Diet of Patient at Date of Attack, with Extras, if any.	Previous malady from which suffering.	General Condition of Patient prior to Attack.	Date of Recovery or Death.	If admitted with Disease where from.	If occurring in Workhouse, Date of Admission to Workhouse.	Other Remarks, &c. + The plus sign opposite a Death indicates that the Epidemic was the direct cause of Death. − The minus sign that it was only an auxiliary cause.
						1894.					1894.			
R	O., Jas.	47	M.	I. C. 4 M.	7.5.94	27th July	Not isolated.	No. 1, milk 1. extra.	Fistula in ano	Good	Recovery, 25th Aug.	-	-	Rash, which was urticarial and papular, appeared 9th Aug. 1894. Prior to this off his food, &c.
R	S., Thos.	73	M.	I. C. 4 M.	7.3.94	27th „	„	No. 1	Tubercular glands.	„	Recovery, 1st Sept.	-	-	Headache, limbache, and prostrate till 12th Aug., when rash papular on chest.
O	B., Isaac	61	M.	I. C. 4 M.	6.10.93	27th „	„	No. 3	Senility	Fair	+ Died 30th July	-	-	Became febrile, flushed. Had bronchitis, and died.
R	N., James	84	M.	1. C. 4 M.	13.3.94	28th „	„	No. 4	„	„	+ Died 21st Aug.	-	-	Very noisy, restless, and delirious. Aug. 12— Began to vomit. About same time, rash on forearms, face, &c. Foot became nearly gangrenous.
O	A., John	42	M.	I. A. 4	26.7.94	28th „	„	No. 3	Bronchitis	Good	Recovery, 9th Aug.	-	-	Pains all over, pains in limbs, &c., and appeared to get more prostrate and worse than his organic disease would account for, and which I could only account for by his milk diet. He, however, made a rapid recovery.
O	K., Hannah	77	F.	I. C. 4 F.	28.12.93	28th „	„	No. 4	Senility	„	+ Died 31st July	-	-	Headache, pains all over, vomiting. Bronchitis and congestion of the lungs set in.

R = Rash. O = without Rash.	Name.	Age.	Sex.	No. of Ward in which Patient was at Date of Attack. I = Infirmary. W = Workhouse.	Date of Admission to Infirmary.	Date of Appearance of Eruption or of other Symptoms if no Rash.	Date of Removal to other Ward, with No. of Ward to which removed.	Diet of Patient at Date of Attack, with Extras, if any.	Previous Malady from which suffering.	General Condition of Patient prior to Attack.	Date of Recovery or Death.	If admitted with Disease, where from.	If occurring in Workhouse, Date of Admission to Workhouse.	Other Remarks, &c. + The plus sign opposite a Death indicates that the Epidemic was the direct cause of Death. − The minus sign that it was only an auxiliary cause.
						1894.					1894.			
R	C., Catherine	36	F.	I. B. 4	19.6.94	28th July	Sept. 1st, B.S.B.	No. 4	Lead colic	Good	Recovery, 10th Sept.	-	-	Semi-isolated in B. 5 for time. Rash, 11th Aug. 1894.
O	F., Elizabeth	45	F.	I. B. 4	26.7.94	28th „	Not isolated.	No. 4	Rheumatism	Ill and weak.	− Died 7th Aug.	-	-	Did well for first two days, and then attacked with vomiting and prostration and dry tongue, &c. Without doubt a superadded toxæmia.
R	R., Esther	19	F.	I. B. 5	10.7.94	28th „	Sept. 1st, B.S.B.	No. 3	Gonorrhœa	Good	Discharged cured, 5th Sept.	-	-	Urticarial rash forearms and body, only lasted few days; but papular on hands, which desquamated.
O	R., Eliza	67	F.	I. B.S.B.	29.5.94	29th „	„	No. 1	Quiescent fibroid phthisis.	Feeble	Sept. 27th, well	-	-	Had headache, backache, and pains in limbs, &c. Vomited and had diarrhœa. *Hæmaturia*, 4th Aug. 1894.
R	D., Sarah	41	F.	I. B.S.B.	5.8.93	29th „	„	No. 3	Ch. rheumatism.	Good	Recovery, 1st Sept.	-	-	Rash, Aug. 20th, 1894, urticarial with a few papules.
R	D., John	32	M.	I. A. 4	28.11.93	30th „	Sept. 1st, A. 5.	No. 3, fish, egg, cocoa.	Phthisis	Feeble	Recovery, 7th Oct.	-	-	August 21st—Severe vomiting and abdominal pain, hæmoptysis and hæmatemesis.
O	A., Michael	62	M.	I. C. 4 M.	2.4.94	30th „	Not isolated.	No. 4	Fistula in ano	„	+ Died 15th Aug.	-	-	Flushed face, febrile, bronchitis and cardiac failure.
R	B., Wm.	42	M.	I. C. 4 M.	5.4.94	30th „	„	No. 4	Hemiplegia	Fair	− Died 19th Aug.	-	-	Rash in August on forearms.

R = Rash. O = without Rash.	Name.	Age.	Sex.	No. of Ward in which Patient was at date of Attack. I = Infirmary. W = Workhouse.	Date of Admission to Infirmary.	Date of Appearance of Eruption or of other Symptoms if no Rash.	Date of Removal to other Ward, with No. of Ward to which removed.	Diet of Patient at Date of Attack, with Extras, if any.	Previous Malady from which suffering.	General Condition of Patient prior to Attack.	Date of Recovery or Death.	If admitted with Disease, where from.	If occurring in Workhouse, Date of Admission to Workhouse.	Other Remarks, &c. + The plus sign opposite a Death indicates that the Epidemic was the direct cause of Death. − The minus sign that it was only an auxiliary cause.
O	Med. Superintendent.	29	M.	I. - -	- -	1894. 1st Aug.	Not isolated.	Used to take good deal of milk.	None -	Good	1894. Recovery in about 7 days.	- -	- -	Febrile for three days.
O	B., Rosina -	53	F.	I. C. 4 F.	11.1.92	2nd „	„	No. 1 -	Epilepsy -	„	Well in about a week.	- -	- -	Headache, pain in abdomen and off food. Febrile for few days. Vomited. Diarrhœa.
O	B., Sarah -	45	F.	I. B.S.B.	19.6.94	2nd „	Sept. 1st, B.S.B.	No. 4 -	Heart disease	Feeble	Recovery, 27th Sept.	- -	- -	Felt sick, but did not vomit. Febrile, 101° F. Albuminuria, 2nd Aug. 1894.
R	Laundry-maid (Neil).	22	F.	I. - -	Many months ago.	2nd „	Not isolated.	Officers' -	None - -	Good	„ „	- -	- -	No premonitory symptoms. Rash first. Became very weak in Sept. Not sick.
R	Nurse Munro.	22	F.	I. - -	„	2nd „	„	„ -	„ - -	„	Lasted about 3 weeks.	- -	- -	No premonitory symptoms before rash. General health good. Not sick.
R	Nurse Dawson.	24	F.	I. - -	„	2nd „	„	„ -	„ - -	„	Lasted about 6 weeks.	- -	- -	Began—headache, vomiting, and diarrhœa. Febrile. Very prostrate for some time. Rash on legs on 14th Aug. 1894.
R	H., Ann -	70	F.	W. No. 42	3.8.94	3rd „	Sept. 1st, B.S.B.	II. - -	0 - -	„	Recovery, 21st Sept.	- -	11.4.78	General health good.
O	C., M. A. -	73	F.	I. A.S.B.	2.7.94	3rd „	Not isolated.	No. 3 -	Injury to chest.	Fair	+ Died 8th Aug.	- -	- -	Progress well till Aug. 3rd, when seized with influenza-like symptoms.

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R	W., Joseph	54	M.	I. A. 4	21.2.94	1894. 4th Aug.	Not isolated.	No. 1, eggs ii., stout vi.	Stricture	Good	1894. Recovery, Sept. 1st.	- -	- -	Had a typical influenza-like attack, with early vomiting, and then rash on 17th Aug. *Epistaxis.*
O	W., Ellen	63	F.	I. A. S. B.	9.1.94	4th „	„	No. 4	Ch. bronchitis and albuminuria.	Fair	– Died 13th Aug.	- -	- -	Sudden vomiting, and influenza-like symptoms set in.
O	C., Hannah	27	F.	W. No. 29	8.8.94	4th „	„	No. 4	None	Good (pregnant).	Recovery, 28th Aug.	- -	About July 21st, 1890.	Febrile. Vomiting and diarrhœa, &c.
O	W., David	27	M.	I. D. 4	13.7.94	4th „	„	No. 1	Ulcer of foot	Good	Discharged well, 23rd Aug.	- -	- -	Very sick and anorexia.
O	M., Maurice	40	M.	I. D. 4	31.7.94	4th „	„	No. 1	Phthisis	Fair	Discharged improved, 7th Sept.	- -	- -	Vomited.
O	W., Amelia	58	F.	I. A. S. B.	25.6.94	4th „	„	No. 4	Debility	„	Recovery, 20th Aug.	- -	- -	Acute headache, vomiting, febrile. Never any rash.
O	P., William	40	M.	I. A. 4	3.8.94	5th „	„	No. 3	Retention of urine.	Good	Discharged, 20th Aug.	- -	- -	Headache, backache. No appetite. Febrile. No rash.
R	W.H.Labour Master.	35	M.	W.	- -	5th „	„	Officers'	Well	„	Recovery, 20th Sept.	- -	More than year in service.	5th Aug.— Influenza-like symptoms. 21st Aug.— Rash.
O	K., Bridget	38	F.	I. B. 4	18.7.94	5th „	Sept. 1st, B. S. B.	No. 1	Lead colic	Fair	Recovery, 10th Sept.	- -	- -	Never any rash. *See* note. But herpes at *angle of mouth.*
O	Nurse Hennessey.	22	F.	I.	- Months ago.	5th „	Not isolated.	Officers'	Well	Good	Left infirmary in few days.	- -	- -	Febrile, vomited, and diarrhœa. Very flushed face. No rash. Very prostrate.

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O	H., Henry	68	M.	I. D. 4	27.5.94	1894. 6th Aug.	Not isolated.	No. 1	Ulcered leg	Good	1894. + Died 14th Aug.			Begun with diarrhœa, then vomited. Hiccough, congestion of the lungs, &c.
O	C., Geo.	52	M.	I. D. 4	31.7.94	6th „	„	No. 1	„	„	Recovery, 20th Sept.			5th Sept. — Petechial "rash" on legs; but there was no real eruption. No fever. Vomited much at onset.
O	F., Robert	54	M.	I. A. 4	6.8.94	6th „	„	No. 4	Bronchitis	Feeble	− Died 22nd Aug.			This man was not sick, and had no diarrhœa, but he became extremely prostrate without sufficient cause.
O	W., Harriet	73	F.	I. A. S. B.	21.7.94	6th „	„	No. 4	Paralysis	„	Recovery, 3rd Sept.			Complained of pain in legs, &c. Anorexia. Pain in chest. Temp., 99° F.
R	C., Ann	51	F.	I. B. 4	19.10.89	6th „	„	No. 4	Hemiplegia	„	+ Died 13th Aug.			Papular rash forearms, which desquamated. Tongue became dry. She had complete anorexia, and died with influenza-like symptoms.
O	K., Catherine	75	F.	W. 42	6.8.94	6th „	„	II.	Senectus	„	+ Died 14th Aug.		31.7.93	Influenza-like attack.
R	F., Robert	61	M.	I. A. 4	5.3.94	7th „	„	No. 1	Cardiac weakness.	Good	Recovery, 20th Oct.			Not febrile at first. Rash earliest symptom, and very extensive. Severe vomiting and hæmatemesis in Sept.

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R	E., Agnes, laundry maid, but off duty.	21 (abt.)	F.	I. - -	- -	7th Aug.	Not isolated.	Officers' -	Injury to arm	Good	Recovery, 30th Aug.	- -	- -	Papular rash on forearms only.
O	L., Ann -	81	F.	W. 42 -	8.8.94	8th „	„	II. -	Senectus -	„	Recovery, 1st Sept.	- -	11.4.94	Diarrhœa and sickness. Febrile. No rash.
R	C., Robt. -	38	M.	I. D. 4 -	31.12.94	9th „	Sept. 1st, A. 5.	No. 4, eggs i	Phthisis -	Fair	Recovery, 17th Sept.	- -	- -	9th August, sick and unwell. 13th, rash (erythematous and Rothelnlike), lasted till 21st August.
R	S., Ed. -	30	M.	I. D. 4 -	6.10.93	9th „	Not isolated.	No. 1 -	Ulcered legs -	Good	Recovery, 28th Aug.	- -	- -	Not sick. Did not vomit. But had a marked erythematous rash which desquamated.
O	C., Ellen -	26	F.	I. A. S. B.	8.8.94	9th „	„	No. 4 -	Heart disease	„	Discharged, cured, 21st Sept.	- -	- -	Was febrile, with headache, &c. But no rash. Very sick.
O	F., John -	76	M.	I. D. 4 -	20.6.94	9th „	„	No. 4 -	Fractured hip	Feeble	− Died, 14th Aug.	- -	- -	Progressing most favourably till he vomited and became febrile and got congestion of lungs.
O	D., John -	48	M.	I. D. 4 -	10.8.94	10th „	„	No. 3 -	Hæmorrhoids	Good	Discharged 28th Aug., improved.	- -	- -	Gastric pain and vomiting, and he passed much blood with stool.
R	H., Catherine	26	F.	I. C. 4 F.	23.6.94	10th „	Sept. 1st, B. S. B.	No. 1 -	Alcoholism -	„	Recovery, 21st Sept.	- -	- -	Papular rash, forearms and hand, Aug. 10th, 1894. Was ill and off food for some time.
O	D., Mary -	52	F.	I. A. S. B.	25.6.94	10th „	Not isolated.	No. 4, milk i.	Debility -	Fair	Discharged 22nd Aug., improved.	- -	- -	

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R	S., Elizabeth	49	F.	I. B. 4	18.6.94	1894. 10th Aug.	Sept. 1st, B. S. B.	No. 1	Abrasion of cornea.	Good	1894. Sept. 30th, cured.	- -	- -	Febrile headache. Foul tongue and breath. No appetite for few days. Then 20th August, blotchy erythema on chin, &c.
O	D., Julia	52	F.	I. B. 4	3.8.94	10th „	Not isolated.	No. 3	Heart disease	Feeble	− Died, Sept. 12th	- -	- -	Vomited a good deal. No rash.
R	Infirmary matron.	—	F.	I.	Years in service.	10th „	- - -	Officers'	Well -	Well	Recovery in few weeks.	- -	- -	Papular itchy rash on legs noticed in August. Prior to this not feeling well.
R	W., Catherine	75	F.	I. B. 4	6.4.94	10th „	Not isolated.	No. 1	Hemiplegia	Good	+ Died, Aug. 17th	- -	- -	Appetite poor for some time. Not vomiting. Hair coming out. Developed bronchitis and died.
O	P., George	67	M.	I. D. 4	7.8.94	11th „	„	No. 4, milk i.	Broncho-pneumonia.	Febrile and ill.	− Died, Aug. 16th	- -	- -	Became very sick 11th, vomiting on 12th and 13th, &c., and had very offensive diarrhœa. Urine, 1020, albuminous.
O	W., Ed.	74	M.	I. A. 4	11.8.94	11th „	„	No. 3	Bronchitis	Very feeble.	− Died, Aug. 26th	- -	- -	This patient was ill on admission. But he developed rigor and vomiting attack which could only be explained on the ground of the epidemic.

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O	D., Rd. -	40	M.	I. A. 4 -	10.8.94	1894. 11th Aug.	Not isolated.	No. 3 -	Rheumatism	Good	1894. Recovery by 1st Sept.	- -	- -	Vomited and appeared very unwell without any other cause than the epidemic. Slightly febrile.
O	W., Mary -	46	F.	I. A. S. B.	8.8.94	11th „	„	No. 3, eggs i., milk ii.	Broncho-pneumonia.	Febrile and ill.	– Died, 2nd Sept.	- -	- -	Severe vomiting.
O	C., Catherine	37	F.	I. C. 4 F. -	14.1.84	12th „	„	No. 3 -	Epilepsy and ch. osteo-arthritis.	Good	Recovery by 1st Oct.	- -	- -	Febrile and off food with exacerbation of the Rh. process. Did not vomit. Very sleepless and restless.
R	C., Thomas	60	M.	I. C. 4 M.	17.8.93	12th „	Sept. 1st, C. 5.	No. 1 -	Hemiplegia -	„	+ Died, 15th Sept.	- -	- -	Extensive papular and erythematous rash. Took food well up to the last. Was demented now. Had apoplectiform attack before death.
R	M., Jas. -	67	M.	I. C. 4 M.	5.4.94	12th „	„	No. 3 -	Dementia after injuries.	„	Recovery, 20th Sept.	- -	- -	Whealy and papular rash. Not febrile. Boil in axilla. Carbuncle on back. Diarrhœa. Only vomited once or twice.
R	W., John -	45	M.	I. A. 4 -	25.10.93	13th „	„	No. 3 -	Deformed ankle from injuries, &c.	Fair	Died, 26th Sept.	- -	- -	Anorexia and mental depression. At length forehead became scaly, and petechiæ over body.

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R	B., Henry -	46	M.	I. D. 4 -	23.6.94	1894. 13th Aug.	Not isolated.	No. 1 -	Eczema on legs and front of elbows.	Good	1894. Recovery, 3rd Sept.	- -	- -	Discharged 3rd Sept, 1894, cured as regards the disease, but the eczema on bend of elbow not quite well. Urticaria and papules, 13th Aug.
R	P., M. A. -	56	F.	I. A. 8	28.6.94	14th „	Sept. 1st., B. 8. B.	No. 1, eggs i.	Albuminuria -	Fair	Recovery, 10th Oct.	- -	- -	No vomiting nor diarrhœa. Febrile at first, 101° F. Afterwards forehead, &c., "scaly."
R	H. Margt. -	45	F.	I. B. 4 -	6.7.94	14th „	Not isolated.	No. 1 -	Hemiplegia -	Good	Discharged improved, at own request, 29th Aug.	- -	- -	Had giddy attack and fell and cut nose. Appetite failed for few days. Not febrile. Forehead afterwards became scaly, and hands showed few desquamating papules.
R	B., Geo. -	55	M.	I. D. 4 -	30.9.89	15th „	Sept. 1st, A. 5.	No. 4, eggs ii., milk i.	Locomotor ataxia.	„	Recovery, 24th Sept.	- -	- -	No vomiting. No diarrhœa. 15th Aug., papular rash on hands and elbows, &c. 21st Aug., transient urticaria. Not febrile.
O	E., Jas. -	63	M.	I. D. 4 -	28.4.94	16th „	Not isolated.	No. 1 -	Ch. bronchitis, cardiac asthenia.	Fair	− Died, 3rd Sept.	- -	- -	No rash. Had been getting much better till 11th Aug. 1894. Rash petechiæ and vibices formed on forearms, &c.
O	B., Wm. -	59	M.	I. D. 4 -	26.4.94	16th „	„	No. 1 -	Ulcered leg -	Good	Recovery, 17th Aug.	- -	- -	Urticarial rash, which lasted only one day.

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O	H., Alice -	30	F.	I. B. -	6.8.94	1894. 16th Aug.	Not isolated.	No. 1, milk i.	Labour -	Good	1894. Discharged 18th Aug. against advice.	- -	- -	Febrils and dirty tongue. Appetite bad. No rash.
O	M., Geo. -	34	M.	I. C. 4 M.	3.2.94	16th „	Sept. 1st, C. 5.	No. 3 -	Tertiary syphilis.	„	Recovery about 10th Sept.	- -	- -	Anorexia, with dirty tongue. Not febrile. Hair came out.
O	J., Jas. -	62	M.	I. D. 4 -	30.1.94	17th „ First seen.	Not isolated.	No. 3, chop i., egg ii., tea, sugar.	Cancer rectum.	Feeble	Recovery, 18th Aug.	- -	- -	Only a temporary urticaria.
R	P., Sophia -	70	F.	W. 30½ -	18.8.94	8th Aug.	Sept. 1st, B. S. B.	II. -	Nil - -	Good	Recovery, 10th Sept.	- -	17.8.94 and in prior to 11.7.94	This patient left workhouse about 11th July, and was re-admitted 17th Aug. 1894, with skin desquamating; disease evidently contracted in workhouse.
R	D., Wm.	53	M.	W. School	22.8.94	18th „	Sept. 1st, C. 5.	I. -	„ -	„	Recovery, 1st Oct.	- -	22.8.93	Kept well.
R	Nurse Simmons.	—	F.	W. -	- -	„	Not isolated.	- -	„ -	„	Well in about week.	-	Long in	Papular and urticarial rash. Hands and forearms and chest.
R	B., Margt. -	68	F.	W. No. 15	18.8.94	18th „	Sept. 1st, B. S. B.	II. -	„ -	„	Recovery, 11th Oct.	- -	27.2.89	Extensive rash about arms, hands, neck, body, and legs—dry.
R	R., Wm. -	69	M.	W. 44 -	22.8.94	19th „	Sept. 1st, C. 5.	II. -	Quite well -	„	Still under treatment.	- -	6.8.88	Married man. Sleeps with his wife at workhouse. She remains quite free.

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O	G., Hannah	30	F.	I. C. 4 F. -	20.7.94	1894. 20th Aug.	Not isolated.	No. 1, eggs i., milk i.	Debility, mental and bodily.	Fair	1894. Recovery 30th Sept.	- -	- -	Aug. 20—Convulsive attack. Lost speech. Febrile, 99·6, 101·4, &c. Vomited greenish fluid. Aug. 25—Right hemiplegia, which lasted till Sept. 1st.
R	T., Martha -	58	F.	W. 40 -	26.8.94	20th „	Sept. 1st, B. S. B.	II., milk ii.	Ch. bronchitis		Recovery, 27th Sept., still feeble.	- -	31.5.81	Febrile and very prostrate. Bronchial catarrh.
R	C., Lucy -	3	F.	W. nursery	24.8.94	24th „	Not isolated.	Milk I.E.W.H. III.	Well - -	Good	Discharged improving, to parents, 31st Sept.	- -	17.8.94	Moist type. Papular rash on ears (both), and circumscribed similar patch dorsum of foot. Rest of body quite free. Febrile first night.
R	C., Fredk. -	4	M.	W. nursery	25.8.94	25th „	Sept. 1st, B.S.B.		„ - -	„	Recovery, 20th Sept.	- -	8.8.94	Fine horny papular rash, forearms and body.
O	B., M. A. -	48	F.	I. B. 4 -	22.8.94	27th „	„	No. 3 -	Injury to knee	„	Recovery, 2nd Oct.	- -	- -	No positive rash, but forearms became very dry, and also forehead. Vomiting, fever, and influenza-like symptoms at onset.
R	H., Hannah	41	F.	W. 29 -	28.8.94	28th „	„	I. -	Well - -	„	Recovery, Oct.	- -	3.4.94	Papular rash, limited almost exclusively to face and neck.
O	S., Sarah	71	F.	W. 43 -	Not ad-	28th „	„	II.	„ - -	„	Recovery, same day.	- -	30.8.93	Urticarial evidently; rash

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O	M., Eliza -	69	F.	W. 30½ -	28.8.94	1894. 28th Aug.	Not isolated.	II. -	Well - -	Good	1894. Still feeble (20th Oct.)	- -	27.1.93	Began with diarrhœa, then had rigor, and became very "dotty." Herpes on face, and afterwards skin very dry and suspicious.
R	R., Elizabeth	79	F.	W. 30 -	31.8.94	31st „	Sept. 1st., B. S. B.	II. -	„ -	„	Recovery, 4th Oct.	- -	18.3.93	Erythematous rash, scalp, face and chest. Not febrile.
R	H., Henry -	5	M.	W. (Receiving Ward.)	31.8.94	31st „	„	III. -	„ -	„	Recovery, 3rd Sept.	These two were in W. H. from 20th Aug. to 24th Aug., and were then free from rash.	20.8.94	Papular rash, forearms, which, by Sept. 3rd, under eucalyptus treatment, had quite gone.
R	H., M. A. -	11	F.	W. (Receiving Ward.)	31.8.94	31st „	„	V. - -	„ -	„	Recovery, 6th Sept.		31.8.94 20.5.94 31.8.94 &c.	Admitted with desquamating papules on hands, evidently of some days' duration.
R	D., Ellen -	6	F.	W. (Receiving Ward.)	31.8.94	31st „	„	Was in W. H. on Aug. 8th, and had bread and milk.	„ -	„	Recovery, 24th Sept.	- -	31.8.94	This child was brought by police to workhouse on Aug. 8th, and had bread and milk. Left same day. Rash very slight.
R	W., Satonia	65	F.	W. 41 -	17.9.94	3rd Sept.	„	II. -	„ - -	„	Recovery, 1st Oct.	- -	6.5.91	Patient did not mention rash till 17th Sept.

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O	J., Elizabeth	64	F.	I. B. 4	4.7.94	6th Sept.	Not isolated.	No. 1	Cancer, breast	Good	Recovery, about 13th Sept.	- -	- -	No rash.
O	M., Jas.	30	M.	W. No. 10	10.9.94	10th „	„	I.	Nil	„	+ Died 14th Sept.	- -	8.9.94	No rash. But febrile, with headache and influenza-like prostrate condition. Died with signs of congestion of lungs without any sign of pneumonia.
O	M., Amelia	71	F.	W. 30	11.9.94	11th „	Sept. 15th	II.	Nil	Good	Recovery, 28th Sept.	- -	2.4.94	Neither patient any rash. Slight fever vomiting and anorexia.
O	S., Sophia	65	F.	W. 15	13.9.94	13th „	„	II.	„	„	Recovery, 28th Sept.	- -	24.5.94	
R	R., Elizabeth	32	F.	W. 30½	14.9.94	14th „	Sept. 14th B. S. B.	I.	Nil, confined 30.7.94	„	Recovery, 11th Oct.	- -	4.9.94	Desquamated condition of forehead. Febrile for day or two.
R	R., Jane	8/12	F.	W. nursery by day, 30½ at night.	14.9.94	14th „	„	Breast	Well	„	Recovery, 11th Oct.	- -	4.9.94	Papular horny rash all over body, but chiefly arms and forearms.
O	K., Ellen	34	F.	I. B. I.	4.9.94	14th „	„	No. 3	Confined 4.9.94, but otherwise well.	„	Discharged, improved 17th Sept., at mothers' request.	- -	- -	Febrile. But feels well, and no other signs.
R	K., Polly	1/12	F.	I. B. I.	4.9.94	14th „	„	Breast	Well	„			- -	Papular horny fine rash.
R	Nurse Wood	35	F.	W.	. .	19th „	Not isolated	Officers'	„	„	Recovery, 10th Oct.	- -	Yearsin	Typical discrete form. Papular rash on forearms, hands, and fingers, and forehead desquamating afterwards.
R	W.H., Assistant Matron's daughter.	18	F.	W.	. .	23rd „	„	. .	„	„	Not known (went away).	- -	15.9.94	In workhouse since Sept. 15th, 1894. Rash same as Nurse Wood; had

TABLE showing the NUMBER of PERSONS and of CASES of EPIDEMIC SKIN DISEASE at each of certain AGE-PERIODS in the INFIRMARY, during June, July, August, and September 1894. (Calculated on Number of Persons in the Infirmary on June 1st, 1894, the date of commencement of Epidemic.)

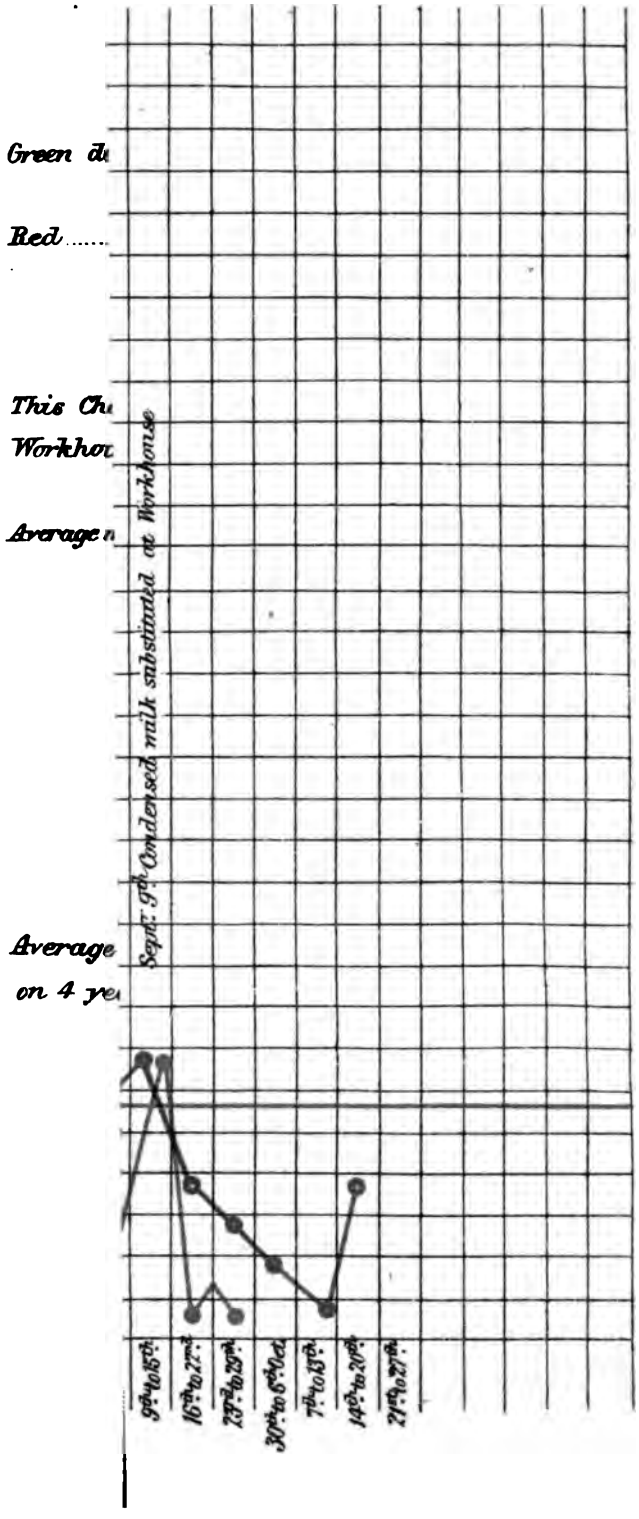
Age.	1 to 9.		10 to 19.		20 to 29.		30 to 39.		40 to 49.		50 to 59.		60 to 69.		70 to 79.		80 to 89.		90 to 100.		Total at all Ages.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Number of persons under treatment at each age - - -	24	26	14	15	36	22	32	27	49	37	55	45	62	67	36	59	9	16	2	3	319	317
Number of cases affected with the epidemic skin disease -	1	—	—	—	1	—	2	2	9	3	9	1	8	10	10	7	4	2	—	—	44	25
Ratio of cases of the disease to inmates of Infirmary at each age; per cent. - - -	4·1	—	—	—	2·8	—	6·2	7·5	18·3	8·1	16·3	2·2	12·8	15·0	30·6	12·0	43·3	12·5	—	—	13·8	7·8
Proportion attacked in both sexes combined; per cent. - -	2		—		1·7		6·8		14·0		10·0		19·4		17·7		24·0		—		10·8	

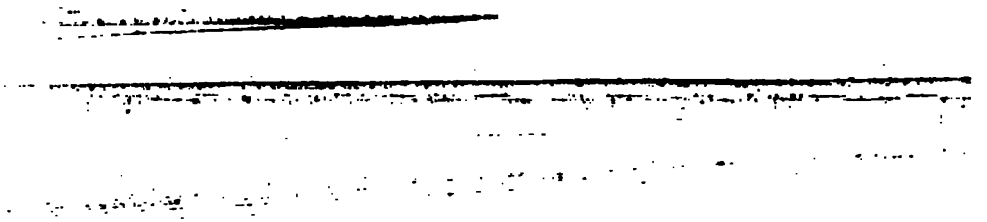
APPENDIX.

Particulars as to Cases of Epidemic Skin Disease occurring in the St. Marylebone Infirmary.

Ward.	Bed.	Name.	Age.	Where admitted from.	Date of Admission.	Date of Appearance of Rash.	Parts affected and Course.	1st, 2nd, or 3rd Attack.	Constitutional Symptoms.	Result.
A 1	17	Charlotte W.	76	W. H. C. Ward	July 31, 1894, with rash.	July 1, 1894	Palms and backs of hands, then general.	1st	Anorexia not very marked, diarrhœa four days.	Cured, Sept. 24, 1894.
A 1	18	Harriet L.	64	W. H. C. Ward	Aug. 8, 1894, with rash.	-	Elbows, then thighs and abdomen, much scaling.	1st	Anorexia and weakness.	Cured, Sept. 24, 1894.
A 1	8	Elizabeth C.	63	28, Wells Street	July 13, 1894, contused face and inflamed glands in neck.	Sept. 7, 1894	Both elbows papular Condensed milk, Sept. 10.	1st	Rise of temp. due to other causes.	Duration, 11 days.
A 2	6	Mary A. C.	63	W. H.	Aug. 16, 1894, with rash.	About June 1894.	Right arm, leg, and body	1st	Anorexia and sickness.	Sept. 22, much better, not yet disappeared.
A 2	13	Sarah S.	69	W. H.	-	-	Elbows.	—		
A 2	8	Mary A. E.	68	W. H.	-	-	Elbows.	—		
A 2	S. W.	Elizabeth B.	76	W. H. D. Ward	Sept. 3, 1894, with rash.	July 3, 1894	Both arms, back of neck, then general. Much itching and scaling. Condensed milk, Sept. 10.	3rd	None	Sept. 22, not well yet.
A 2	13	Isabella R.	78	W. H. G. Ward	Sept. 12, 1894, with rash.	July 12, 1894	Arms and legs eczematous in character, slightly on body. Great scaling and weeping. Condensed milk; no local treatment.	2nd	None.	
A 2	19	Ann C.	56	W. H. 24	Sept. 13, 1894, with rash.	-	General. Much scaling and itching.	—	Not sensible enough to answer questions. Albuminuria and uræmic fits.	
A 3	26	Mary R.	68	10, Devereux Street, Lisson Grove.	Jan. 17, 1894	Sept. 10, 1894	Front of elbows, also lower parts of back.	1st	None	Cured, duration three weeks.

CHAR 1894 to October 20th 1894.





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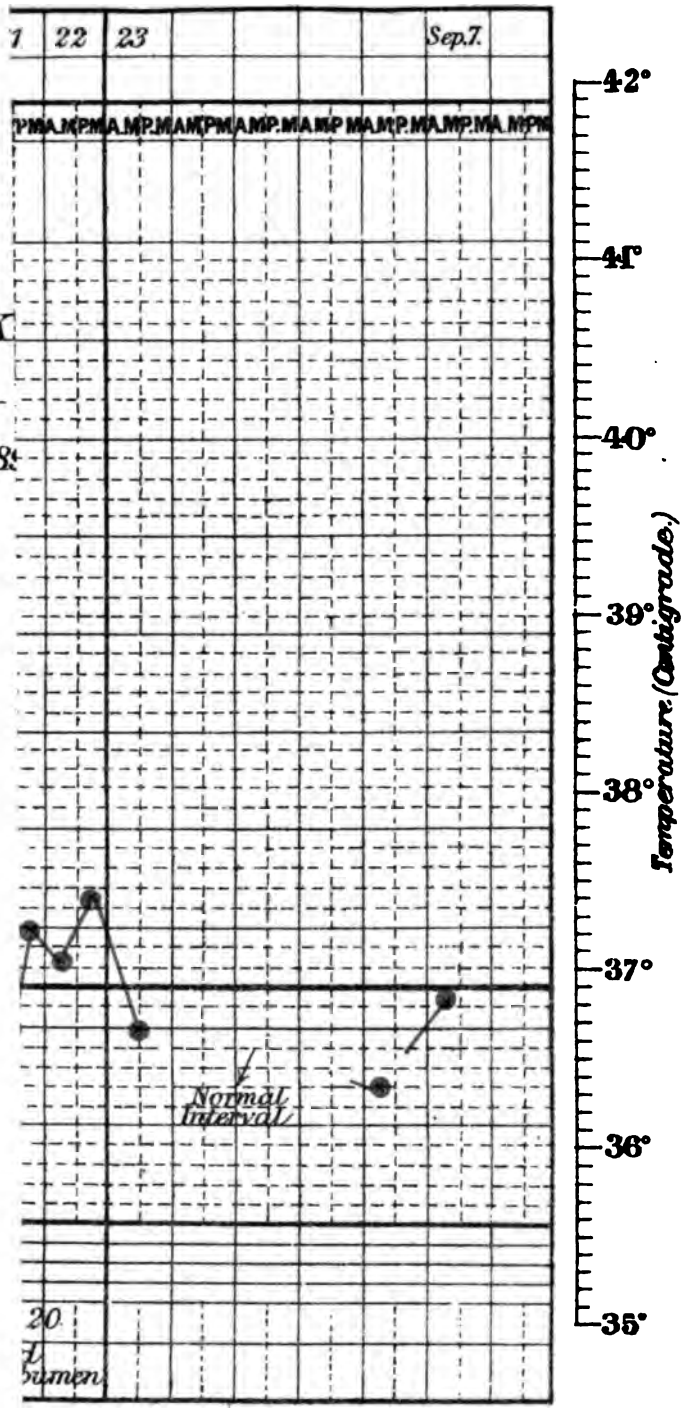

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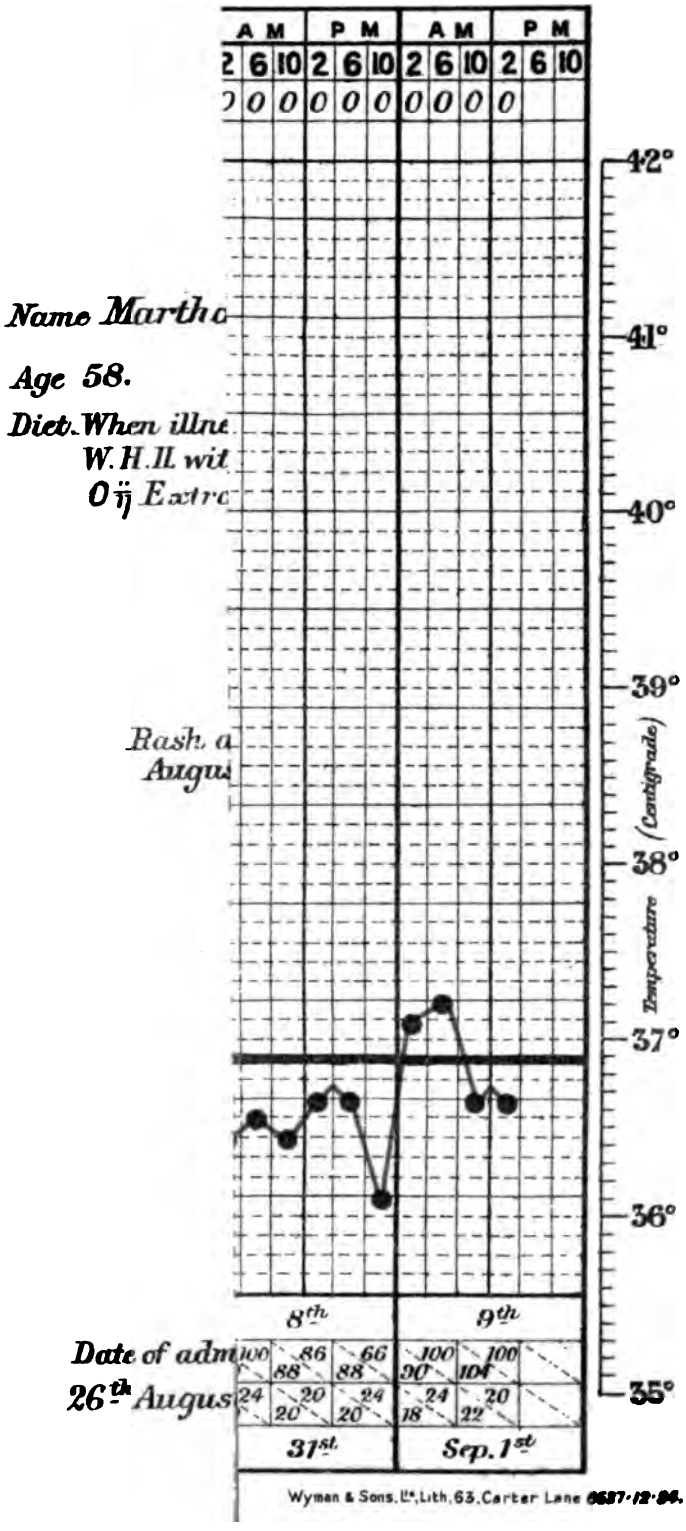
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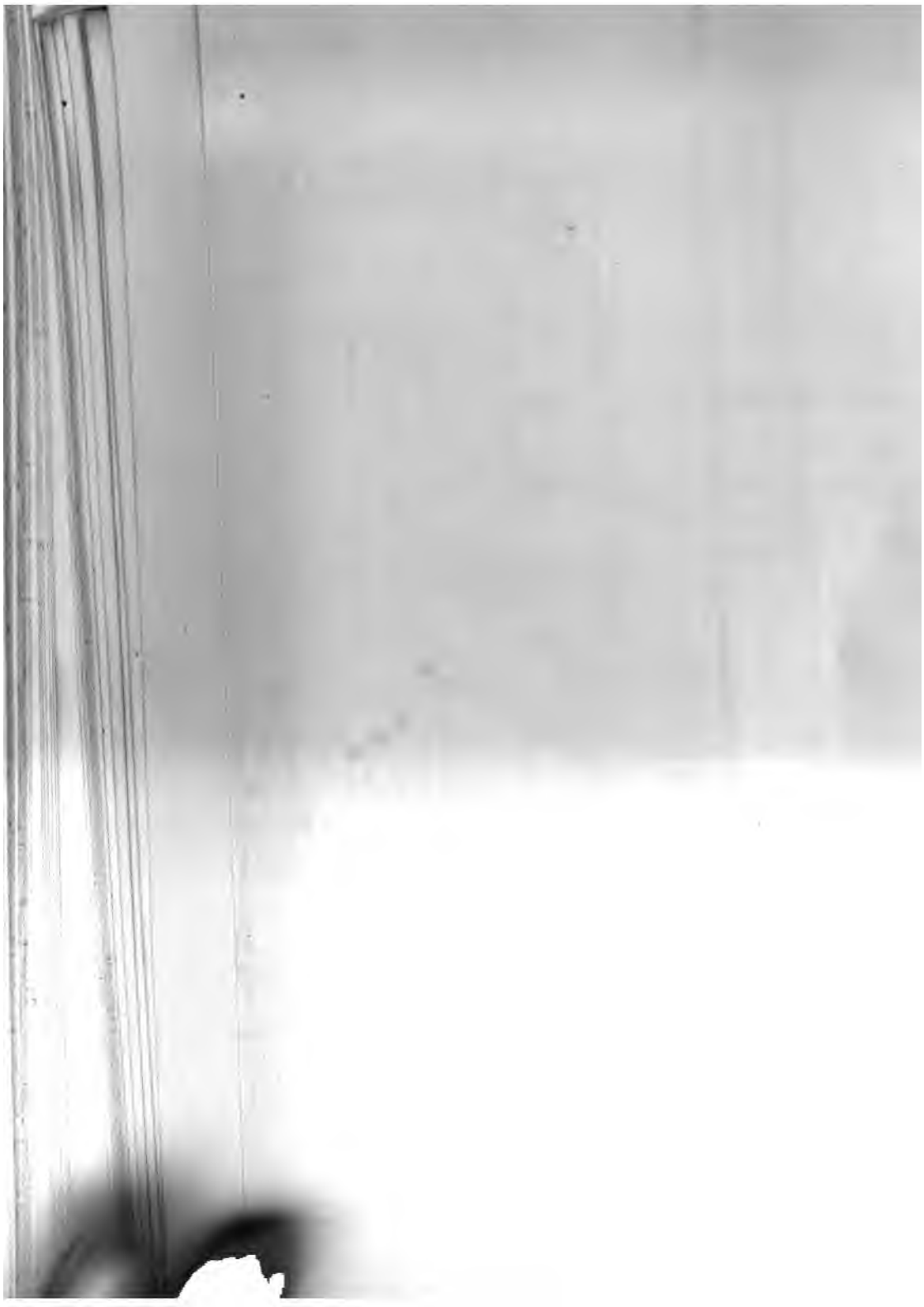

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Chart N°8.

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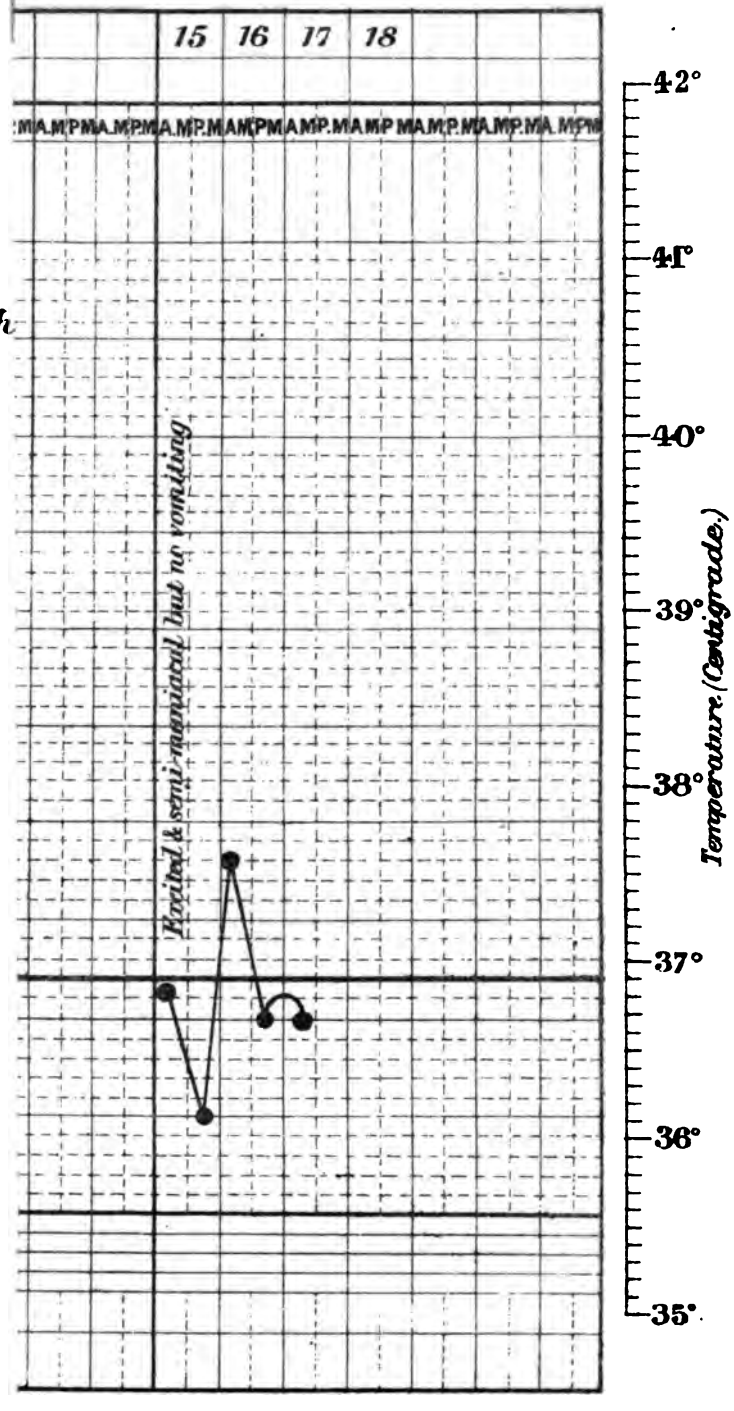

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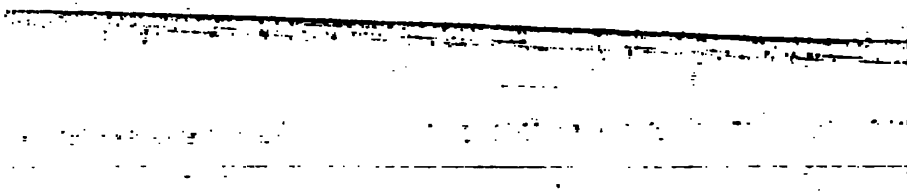

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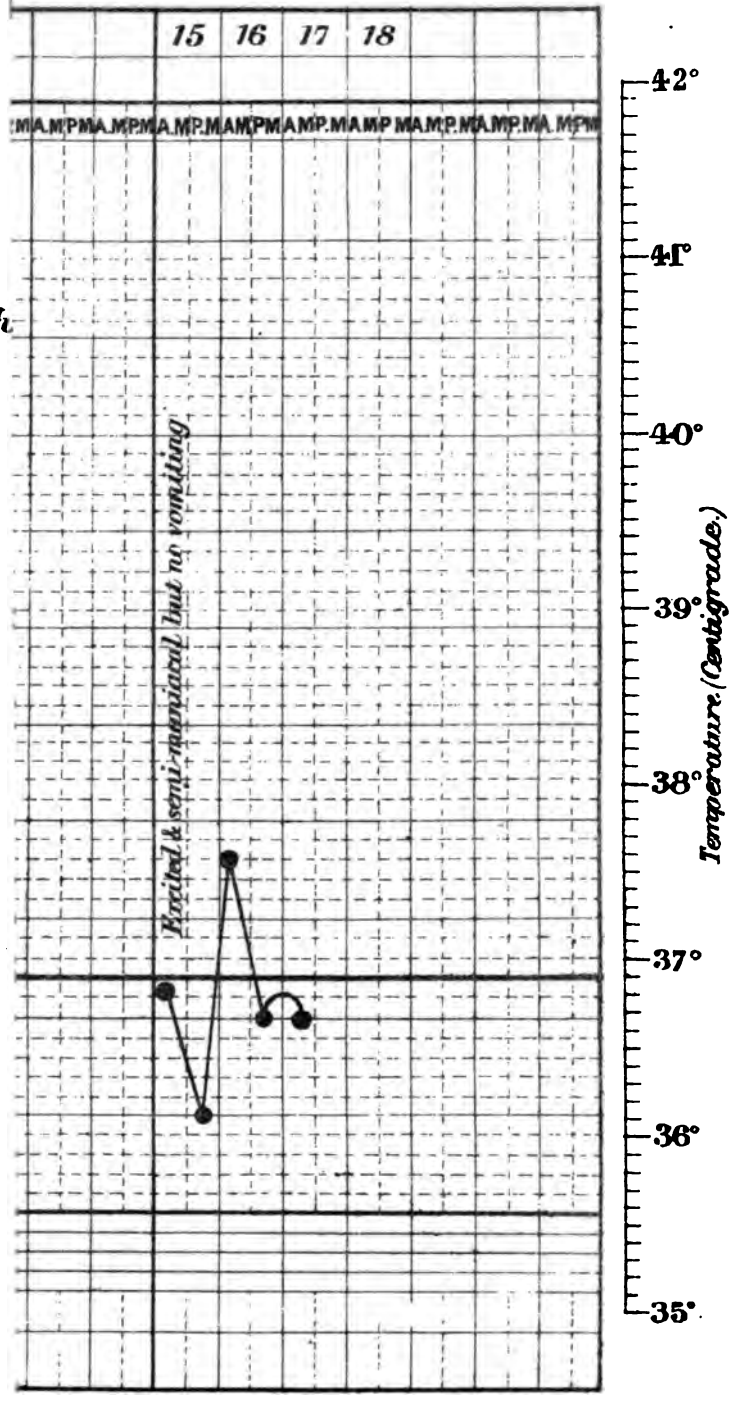

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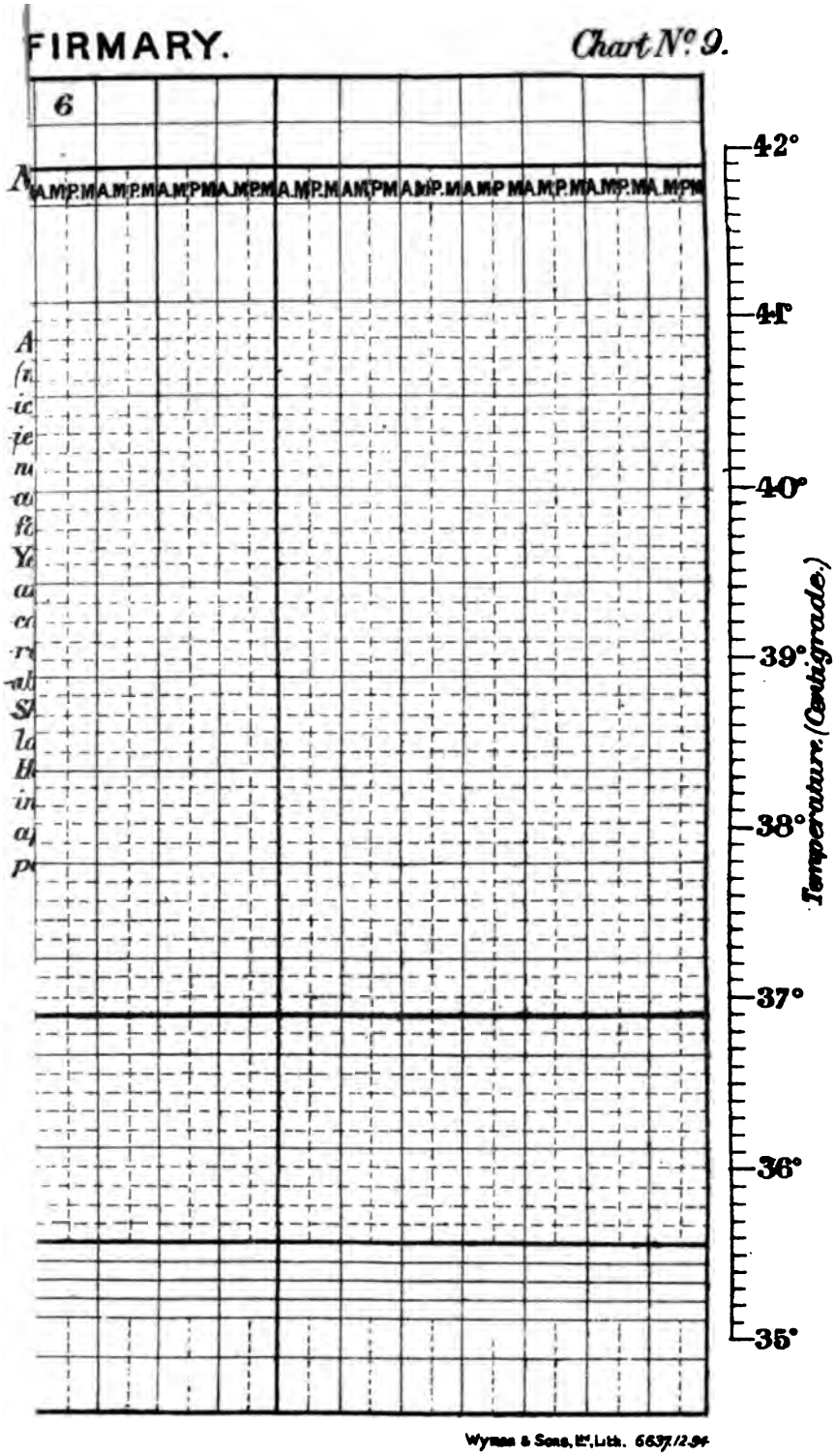
FIRMARY. *Chart No. 9.*



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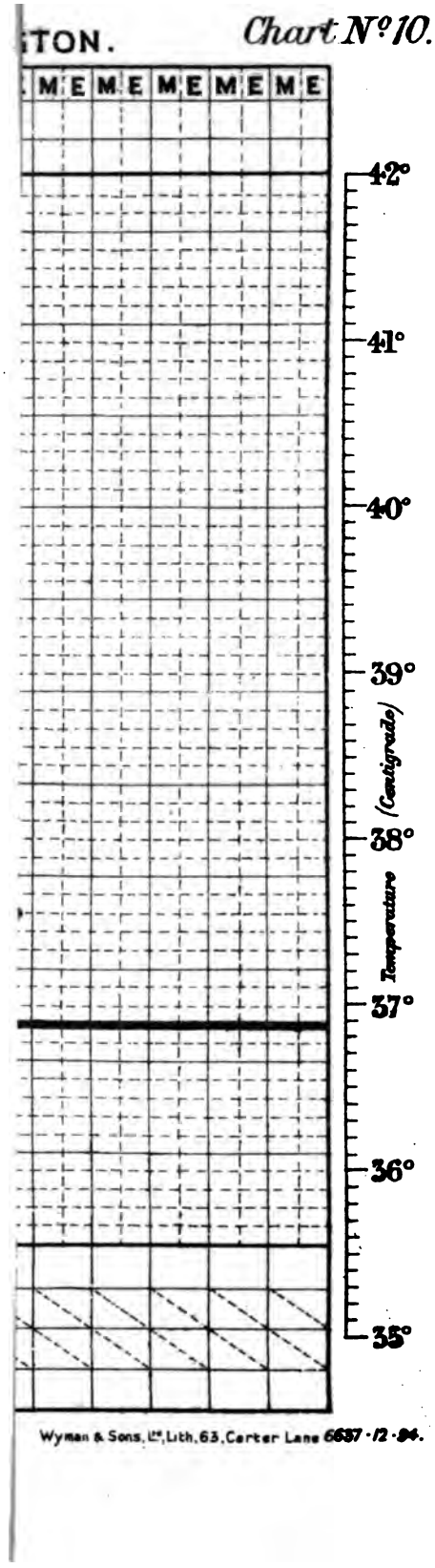
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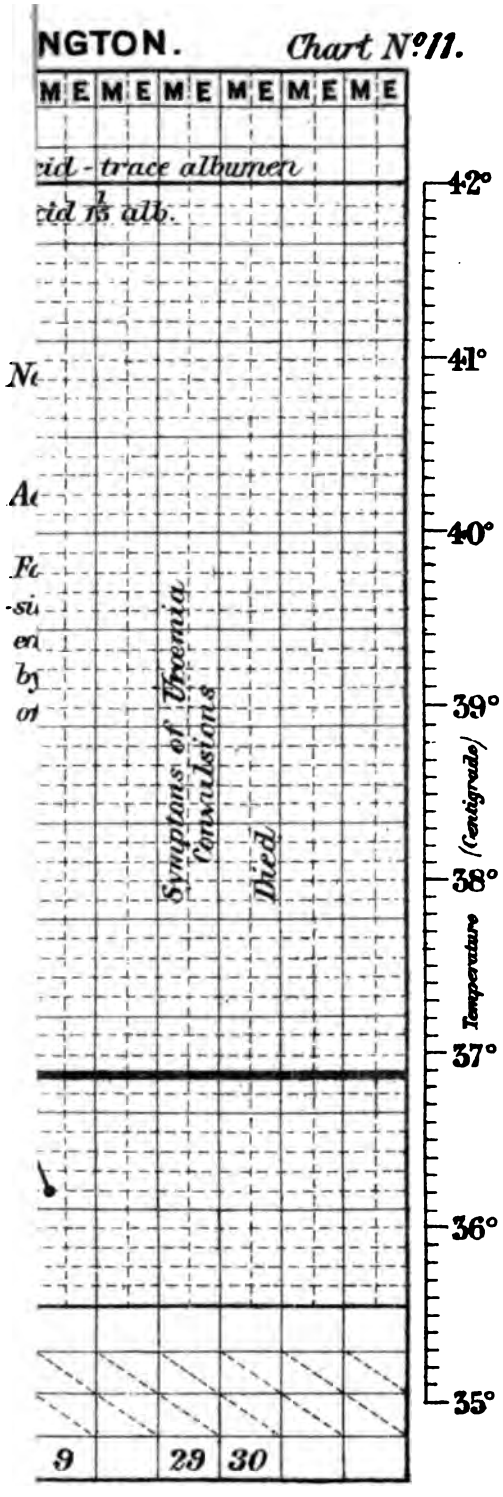

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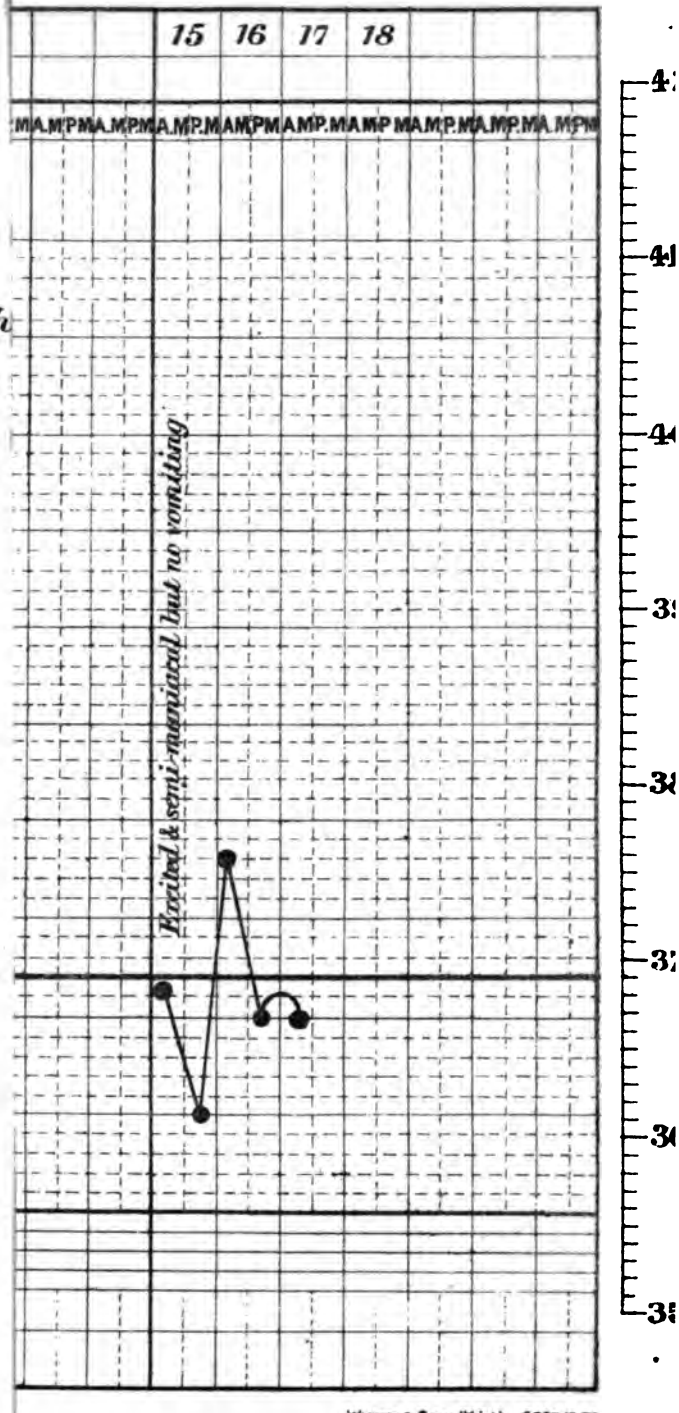

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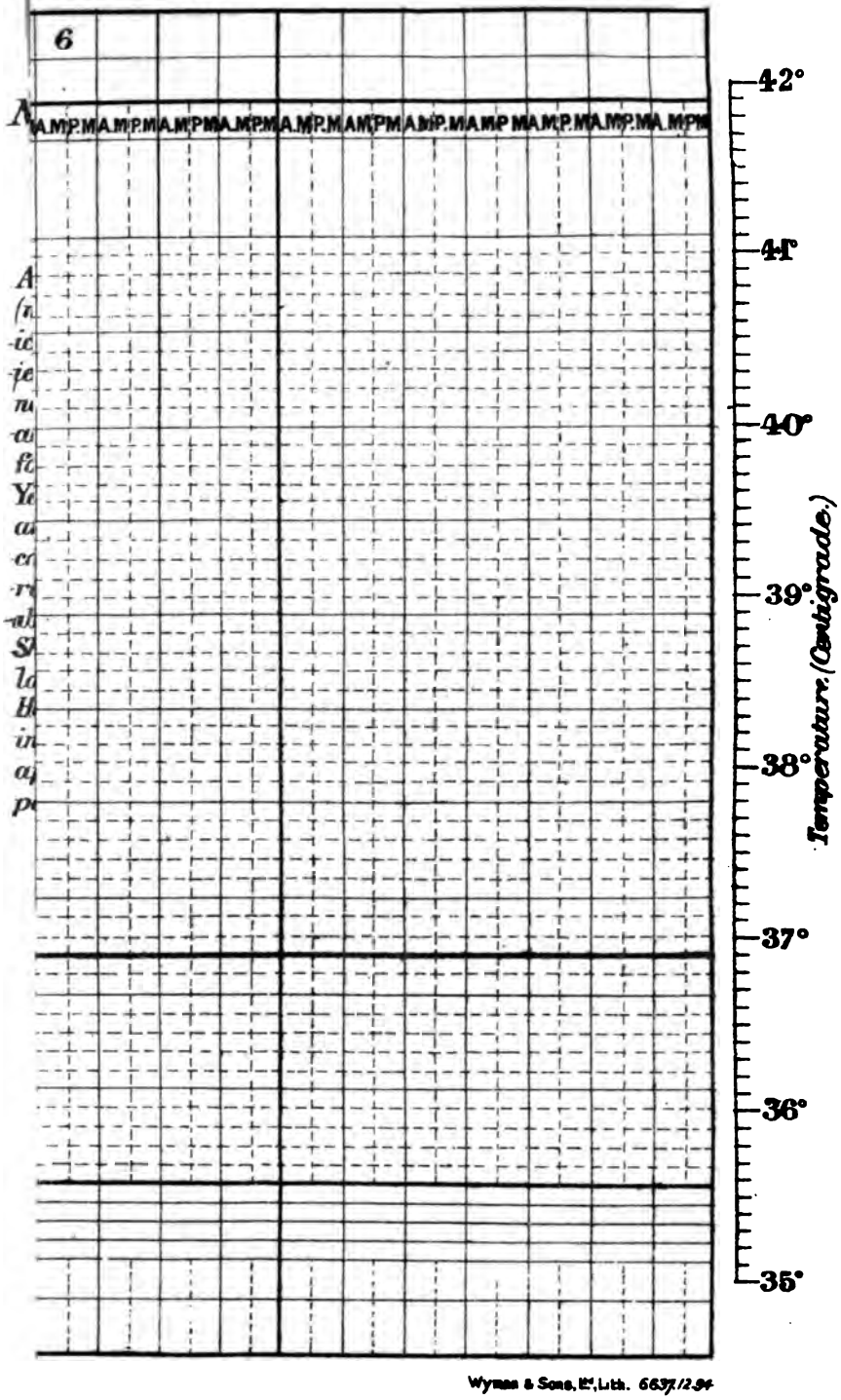

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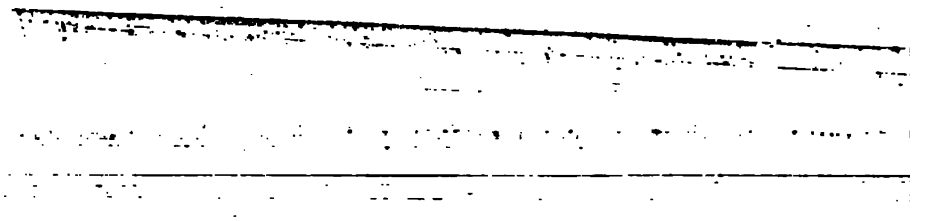

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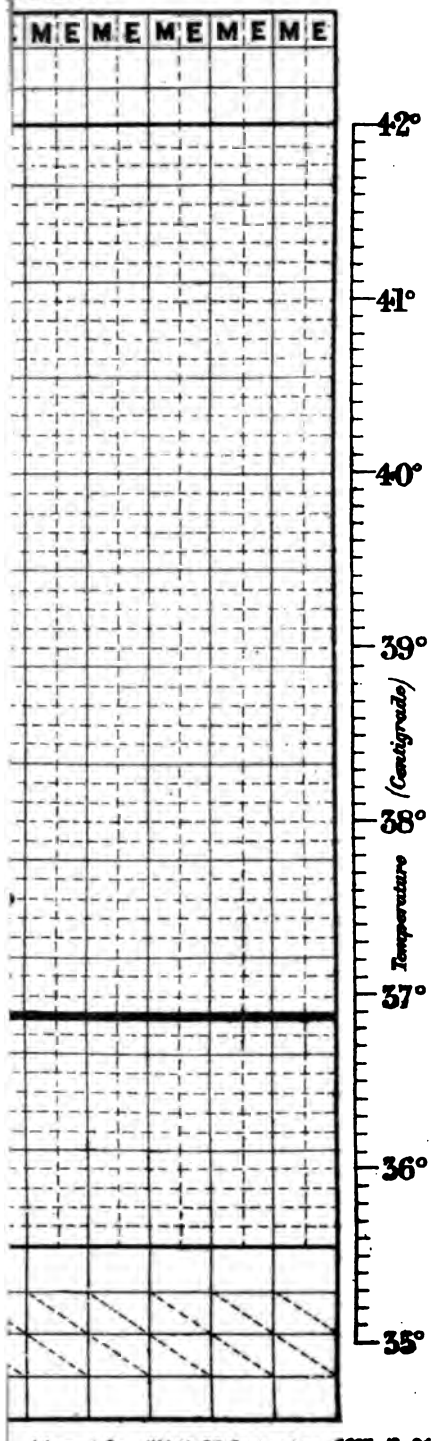

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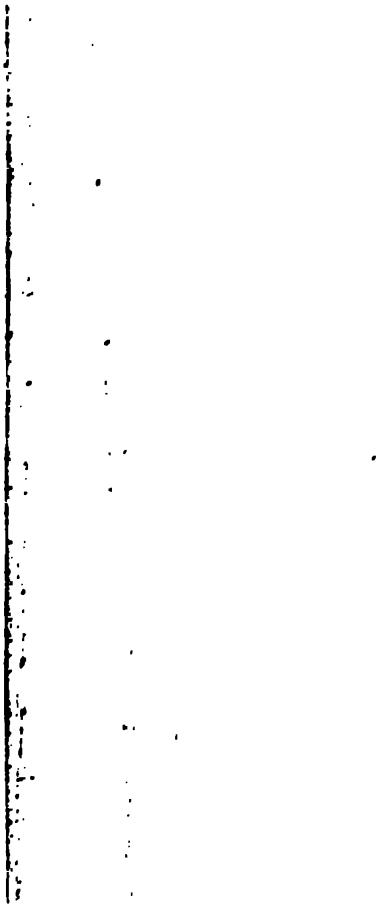

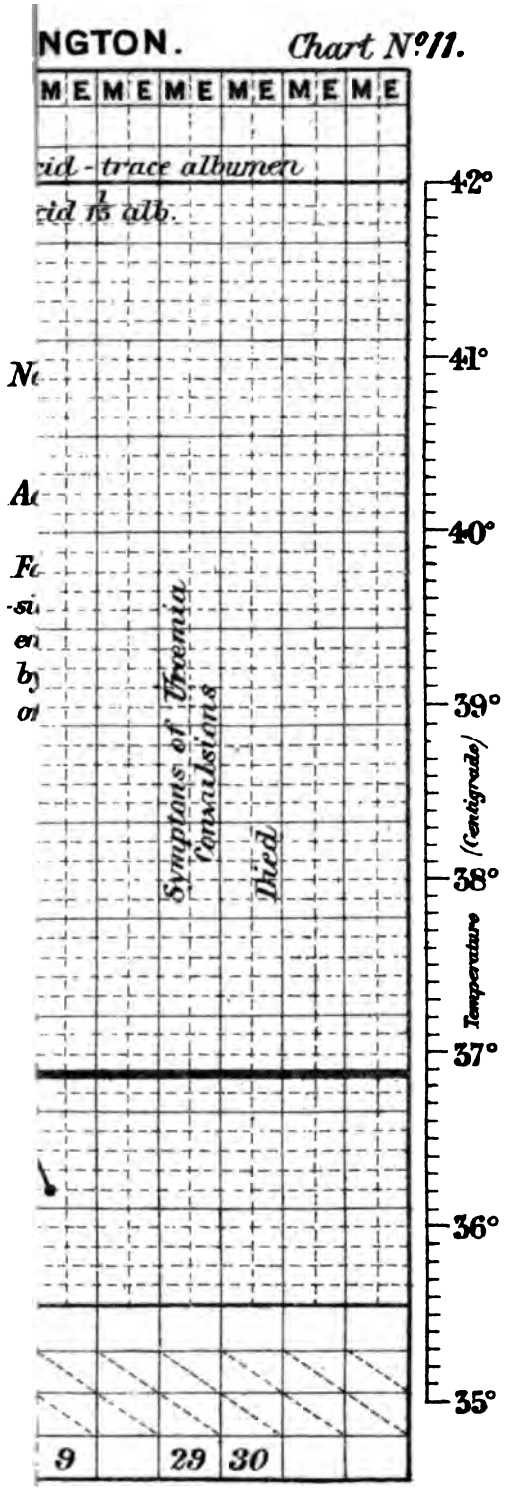

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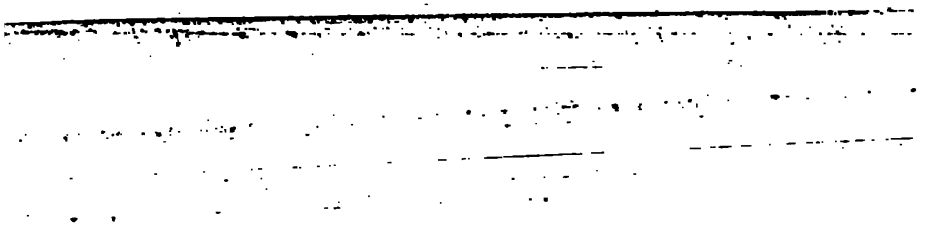
						Rash.		Attack.	Symptoms.	
B 1	—	Dinah K., *alias* B.	60	4, Quebec Mews, S. M. B.	May 11, 1894, with catarrh of bladder.	Sept. 4, 1894	Back and hands papular	—	None.	
B 1	19	Mary G.	73	W. H. Pettiford's Hall.	May 16, 1894, with epilepsy and partial paralysis.	Sept. 11, 1894	Arms and face papular in character, itching.	—	No temp. No anorexia.	
B 2	S. W.	Johanna R.	46	21, Grays Bridge, S. M. B.	Aug. 30, 1894, with rash.	Middle of June, 1894.	First on feet, then back and chest, then hands. Lastly legs, where it was most severe.	1st	Anorexia and nausea after food.	Sept. 22, nearly well.
B 2	6	Louisa C.	43	Saffby Shelter	June 25, 1894	Aug. 2, 1894	Left foot, then legs and arms, then back, papular rash very slight. No scaling, great itching. Condensed milk, Sept. 13.	1st	Sickness and attacks of fainting.	Sept. 22, nearly well.
B 2	28	Annie H.	38	9, Marylebone Lane.	July 23, 1894	Aug. 27, 1894	Arms, hands, then chest and legs, papular rash with subsequent scaling.	1st	None	Sept. 22, rash not yet disappeared.
B 3	13	Elizabeth P.	87	W. H. 25a.	Aug. 27, 1894, with rash.	Aug. 20, 1894	General granular at first, weeping, especially behind ears. Itching severe.	1st	Anorexia not marked, diarrhœa one day, great weakness.	Sept. 22, much better, not yet well.
B 3	19	Hannah C.	69	9, Hereford Street, S.M.B.	Feb. 25, 1891, eczema,	Aug. 28, 1894	First on legs, then all over body and neck.	2nd	Temp. 102° F consecutive to axillary abscess, otherwise normal	Aug. 28, not quite well axillary abscess
B 3	15	Amelia W.	73	43, Christian Union Almshouses.	June 8, 1894, fractured femur.	Sept. 13, 1894	Elbows first, then down front and back of forearms. No where else	1st	None	Local [illegible] two weeks
B 3	S. W.	Ellen E.	67	W. H.	Sept. 4, 1894, with rash.	[illegible]	Hands chiefly affected	1st	[illegible]	[illegible]
C 1	16	Anne B.	67	172, Great Titchfield Street.	June 12, 1894, with rash	May 30, 1894	[illegible]	[illegible]	[illegible]	



Ward.	Bed.	Name.	Age.	Where admitted from.	Date of Admission.	Date of Appearance of Rash.	Parts affected and Course.	1st, 2nd, or 3rd Attack.	Constitutional Symptoms.	Result.
B 1	—	Dinah K., *alias* B.	60	4, Quebec Mews, S. M. B.	May 11, 1894, with catarrh of bladder.	Sept. 4, 1894	Back and hands papular	—	None.	
B 1	19	Mary G.	73	W. H. Pettiford's Hall.	May 16, 1894, with epilepsy and partial paralysis.	Sept. 11, 1894	Arms and face papular in character, itching.	—	No temp. No anorexia.	
B 2	S. W.	Johanna R.	46	21, Grays Bridge, S. M. B.	Aug. 30, 1894, with rash.	Middle of June, 1894.	First on feet, then back and chest, then hands. Lastly legs, where it was most severe.	1st	Anorexia and nausea after food.	Sept. 22, nearly well.
B 2	6	Louisa C.	43	Saffby Shelter	June 25, 1894	Aug. 2, 1894	Left foot, then legs and arms, then back, papular rash very slight. No scaling, great itching. Condensed milk, Sept. 13.	1st	Sickness and attacks of fainting.	Sept. 22, nearly well.
B 2	28	Annie H.	38	9, Marylebone Lane.	July 28, 1894	Aug. 27, 1894	Arms, hands, then chest and legs, papular rash with subsequent scaling.	1st	None	Sept. 22, rash not yet disappeared.
B 3	13	Elizabeth P.	87	W. H. 25a.	Aug. 27, 1894, with rash.	Aug. 20, 1894	General granular at first, weeping, especially behind ears. Itching severe.	1st	Anorexia not marked, diarrhœa one day, great weakness.	Sept. 22, much better, not yet well.
B 3	19	Hannah C.	69	9, Hereford Street, S.M.B.	Feb. 25, 1891, eczema,	Aug. 28, 1894	First on legs, then all over body and neck.	2nd	Temp. 102° F. once due to axillary abscess, otherwise normal.	Aug. 28, not quite well, axillary abscess.
B 3	15	Amelia W.	73	45, Christian Union Almshouses.	June 8, 1894, fractured femur.	Sept. 13, 1894	Elbows first, then down front and back of forearms. Nowhere else.	1st	None	Cured, duration two weeks.
B 3	S. W.	Ellen E.	67	W. H.	Sept. 4, 1894, with rash.		Hands chiefly affected	1st	No anorexia. No temp.	Sept. 23, insisted on going out, hands scaling profusely still.
C 1	16	Anne B.	67	172, Great Titchfield Street.	June 12, 1894, with rash.	May 30, 1894	Body, arms, and face	1st	Diarrhœa and albuminuria.	

Ward.	Bed.	Name.	Age.	Where admitted from.	Date of Admission.	Date of Appearance of Rash.	Parts affected and Course.	1st, 2nd, or 3rd Attack.	Constitutional Symptoms.	Result.
C 2	Cot.	John S.	4	- - -	April 18, 1894, rickets.	Sept. 1, 1894	Papular rash on face - -	1st	- - - -	Cured, duration three weeks; discharged, Sept. 26.
C 3	20	Catherine D.	77	1, Buckingham Street.	Aug. 24, 1894, with rash.	Aug. 16, 1894	Arms, then right thigh, becoming general, excepting face. It went on to formation of small pustules, which ruptured and discharged copiously.	2nd	Great anorexia -	Cured, duration six weeks.
C 3	14	Sarah C.	81	W. H. - -	Sept. 18, 1893	Aug. 17, 1894	Whole body at once. Began as papular eruption, body becoming redder day by day, till it was almost scarlet.	1st	None - - -	Sept. 22, rash still present, with some exfoliation.
C 3	7	Jane L. -	49	7, Little North Street.	Aug. 14, 1894, rheumatism and dementia.	Sept. 10, 1894	Face and arms papular, very little scaling.	—	Slight anorexia.	
D 3	6	Alice W.	35	27, Primrose Street, S. M. B.	Nov. 4, 1892, hemiplegia.	Aug. 17, 1894	Arms, hands, face, slightly on legs.	2nd	None - - -	Cured, duration three weeks.
D 3	15	Eleanor S. -	79	25, Union Street	Jan. 1, 1892	June 20, 1894	Thighs only, but becoming general.	1st	None - - -	Cured, duration one month.
E 1	18	Frederick C.	57	W. H. - -	June 15, 1894	Aug. 4, 1894	First on face and neck, then arms, and front and back of body, general.	1st	Weakness and anorexia. Temp. normal.	Sept. 20, still slight papular rash on face.
E 1	5	James F. -	57	- - -	Feb. 22, 1893, with locomotor ataxy.	Aug. 4, 1894	Papular rash on forehead, then back and front of body, arms, legs, and feet, became general.	4th	Weakness, anorexia, and nausea.	Cured, duration four weeks.
E 1	6	Samuel T. -	40	33, Newnham Street, S. M. B.	Oct. 17, 1894	Aug. 21, 1894	Papular, starting on elbows, then [illegible]	1st	Anorexia and sickness	Cured, duration one month.

Ward.	Bed.	Name.	Age.	Where admitted from.	Date of Admission.	Date of Appearance of Rash.	Parts affected and Course.	1st, 2nd, or 3rd Attack.	Constitutional Symptoms.	Result.
E 1	14	Samuel N.	82	W. H.	1889	Aug. 29, 1894	Papular rash on elbows and forearms, then higher up arms.	6th	Anorexia and weakness. No temp. No itching.	Cured, duration three weeks.
E 3	16	John C.	75	W. H., No. 6 Ward.	May 3, 1894	?	Rash on left foot on admission, spread to legs, then to arms, finally body and head.	—	None. Great itching	Sept. 21, rash nearly cleared up, still some on legs.
E 3	19	Frederick S.	66	W. H.	July 7, 1893, hemiplegia.	Aug. 18, 1894	First on back, neck, and chest, then legs, feet, arms, and hands. Condensed milk, Sept. 10th.	—	" " "	Sept. 29, still some rash.
E 3	9	Joseph H.	52	" "	Nov. 1, 1893, sinus in thigh.	Aug. 24, 1894	First chest, then shoulders and legs in patches.	3rd	Itching, anorexia. Temp. has been high at times.	Cured, six weeks.
E 3	10	Thomas S.	47	Shaftesbury shelter.	May 24, 1894	Aug. 24, 1894	First on back and chest, then arms, hands, feet, and legs. Face not affected	1st	Temp. normal, anorexia not marked, much itching.	
E 3	S. W.	Frederick B.	71	W. H., No. 16	May 2, 1894	Sept. 5, 1894	Back and neck, then arms. Not general.	1st	Anorexia and nausea. Temp. normal.	Sept. 20, still slight rash on arms and legs.
E 3	13	George F.	45	142, Carlisle Street.	April 19, 1892	Sept. 5, 1894	First forearms, then abdomen and thighs. Nowhere else.	1st	None	Cured, duration three weeks.
F 1	4	James A.	56	S. A. Shelter, Lisson Grove.	Feb. 18, 1894	Aug. 21, 1894	Commenced on back of neck, the arms, and chest. Great itching.	1st	Anorexia	Cured, duration four weeks.
F 1	17	James B.	52	W. H., No. 6 Ward.	Nov. 24, 1894	Aug. 21, 1894	Forearms, then front and back of body, face, legs, and feet; much itching.	1st	Anorexia. Temp. raised on three evenings. Face much swollen, eyelids puffy. No albuminuria.	Duration four weeks, but some scaling later.
F 1	7	William G.	78	46, Church Street	July 6, 1891	Aug. 22, 1894	Forearms, legs, and feet, then forehead. None on body or above knees.	1st	Weakness and nausea	Cured, duration four weeks.

Ward.	Bed.	Name.	Age.	Where admitted from.	Date of Admission.	Date of Appearance of Rash.	Parts affected and Course.	1st, 2nd, or 3rd Attack.	Constitutional Symptoms.	Result.
F 2	21	Thomas V.	58	W. H.	June 16, 1890, with ulcerated leg, and tubercular testis.	Aug. 16, 1894	Back of neck, then face, chest, arms, back. Papular very red, hard, spotty.	1st	Anorexia, sleeplessness, constip. Temp. high all the time, accounted for by tubercle.	Cured, duration 10 days, but skinning continues. *Died of Phthisis*, Sept. 30th.
F 2	1	Arthur C.	40	May 18, 1894, from 34, Devonshire Street, L. G.	- - -	Sept. 18, 1894	Papular rash, appearing first on extensor aspect of forearms, then on knees and ankles, then back. Nose and eyes slightly affected.	—	Great anorexia, tremors. Temp. subnormal, diarrhœa one week.	Sept. 21, rash nearly all faded.
F 3	7	William N.	43	54, Bell Street	Aug. 13, 1894, with fistula.	Aug. 28, 1894	Started on arms, neck, back, and legs. Face later scaly, rather than papular. Condensed milk, Sept. 10th.	2nd	Severe conjunctivitis. Temp. 102·4 at one time. Great itching anorexia.	Cured, duration four weeks.
F 3	9	Edward H.	70	W. H., 16 B.	April 5, 1894, large prostate.	Sept. 5, 1894	Face and neck not general, not much scaling. Condensed milk, Sept. 11th.	1st	None.	
F 3	6	Edward W.	48	- - -	Aug. 3, 1894, with ulcerated leg.	Sept. 11, 1894	Started on back of neck, and spread to right side of face, Condensed milk, Sept. 11th.	1st	None - - -	Cured, Sept. 19th.
G 1	26	Henry H.	84	W. H. - -	Nov. 24, 1893	Sept. 2, 1894	Back and arms, then general, Condensed milk, Sept. 10th.	1st	Anorexia. Temp. subnormal.	Cured, duration four weeks.
G 1	9	William F.	73	54, Bell Street	Sept. 4, 1894, with bronchitis and asthma.	- - -	Papular rash on back of right hand.	—	- - - -	Cured, Sept. 29, 1894.
G 1	24	Arthur M.	24	S. A. Shelter	May 5, 1894	Sept. 5, 1894	Red raised papular rash on both arms, flexor surface extending up the arms.	1st	None - - -	Cured, duration two weeks.
G 2	S. W.	James T.	50	45, Lisson Street	May 18, 1894	Aug. 4, 1894	First hands and wrist, then feet. Condensed milk, Sept. 10th.	1st	Slight anorexia. Temp. normal.	Cured, duration seven weeks.

Ward.	Bed.	Name.	Age.	Where admitted from.	Date of Admission.	Date of Appearance of Rash.	Parts affected and Course.	1st, 2nd, or 3rd Attack.	Constitutional Symptoms.	Result.
G 2	25	William A.	44	86, Richmond Street.	July 25, 1894	Sept. 3, 1894	First on leg, then elbows, then back, spreading gradually. Condensed milk, Sept. 10th.	1st	Anorexia and sickness. Temp. normal.	Cured, duration four weeks.
G 3	11	Charles G.	64	- - -	April 30, 1894	July 3, 1894	From wrist upwards on face, back, legs last. Came in patches. A week before death the rash on legs became purpuric, the face peeled, and was scarlet coloured.	1st	Temp. sub-normal, great itching, conjunctivitis. Legs were œdematous.	*Died Sept.* 24, 1894.
H 1	S. W.	John B.	69	W. H., No. 5 Ward.	Aug. 23, 1894, with rash.	Aug. 14, 1894	Papular rash, came suddenly all over body at once. Condensed milk, Sept. 10th.	1st	Axillary abscess formed, great weeping and scaling.	Sept. 29, practically well, duration seven weeks.
H 1	22	Alfred G.	61	18, Burne Street	Feb. 2, 1894, bronchitis.	Aug. 30, 1894	Back and arms, papular exudation. Condensed milk, Sept. 10th.	1st	- - - -	Cured, duration four weeks.
H 1	6	James R.	56	W. H., No. 5	Sept. 4, 1894, with rash.	- - -	Back of hands and knees, on Sept. 18th; it came out on back and right side of neck.	—	No anorexia, itching before the rash. Temp. sub-normal.	Cured, Sept. 24, 1894.
H 1	13	Robert C.	71	- - -	Aug. 25, 1894	Not known	On hands only - - -	—	Developed pneumonia	*Died Sept.* 6, 1894.
H 1	14	Henry J.	68	27, Stafford Street.	Sept. 11, 1889	Aug. 18, 1894	First back, then legs and arms, then head. Condensed milk, Sept. 10th.	4th	- - - -	Sept. 29, very slight. Still on ankle.
H 1	15	Frederick M.	66	W. H.	Aug. 2, with the rash.	- - -	Both ankles, remained localised.	1st	None	Cured, duration five weeks.
H 2	10	Henry G.	83	- - -	Nov. 27, 1893, with asthma after admission.	About five months.	General - - - -	—	- - - -	*Died Aug.* 22, 1894.
H 2	20	Walter C.	42	- - -	July 13, 1893, with liver disease.	Aug. 22, 1894	Arms and knees, then elbows and body. Spread gradually. Great itching.	1st	Temp. normal. No alb.	Cured.

Ward.	Bed.	Name.	Age.	Where admitted from.	Date of Admission.	Date of Appearance of Rash.	Parts affected and Course.	1st, 2nd, or 3rd Attack.	Constitutional Symptoms.	Result.
H 2	S. W.	John P. -	70	- - -	May 10, 1894, for liver disease.	Aug. 10, 1894 -	General - - - -	—	Rapidly became weaker.	*Died Aug.* 23, 1894.
H 2	S. W.	John P. -	50	W. H., No. 6 -	Sept. 11, 1894, with rash.	Three weeks before admission.	First neck, then elbows and wrist, then body.	1st	None - - -	Sept. 29, much better.
H 2	S. W.	William E. -	37	- - -	Sept. 2, 1894, came in with it.	?	General papular - -	—	Nephritis - -	*Died Sept.* 4, 1894.
H 3	—	Robert B. -	70	W. H., No. 6 Ward.	June 4, 1894 -	Jan. 1894 -	General - - - - Condensed milk, Sept. 10th.	3rd	Severe itching, severe conjunctivitis.	Sept. 29, still peeling greatly.
H 3	13	Charles W. -	78	- - -	Mar. 16, 1894 -	June 1, 1894 -	Back, buttocks, then legs -	1st	Temp. subnormal -	Duration two months.
H 3	7	Henry H. -	65	St. George's, Hanover Square.	Feb. 27, 1894 -	July 30, 1894 -	Began on elbows, spread to wrists, then face and shoulders. Condensed milk, Sept. 10th.	3rd	Temp. subnormal, severe conjunctivitis, diarrhœa four days.	Sept. 29, not quite well.
H 3	S. W.	Michl. C. -	83	- - -	June 8, came in with it.	Unknown -	General - - -	?	Patient not intelligent	*Died Aug.* 25.
H 3	S. W.	Henry T. -	75	W. H., No. 6 Ward.	Aug. 23, with rash.	About Aug. 8 -	General - - - - Condensed milk, Sept. 12th.	1st	Severe anorexia, weakness, conjunctivitis.	Sept. 29, slight peeling still.
H 3	23	Edwd. M. -	31	S. A. Shelter, Lisson Grove.	Apr. 30, 1894. acute rheumatism.	Aug. 31, 1894 -	First on elbows and knees, then face, body, arms, legs, papular becoming dry.	1st	Pains in head and limbs, sickness.	Cured, duration nine days.
H 3	22	Fredk. C. -	40	- - -	- - -	Sept. 16, 1894 -	Itching, papular rash on knees and forearms.	—	—	—
		T. (porter) -	Had charge of the bath during absence of bathman from Aug. 25th till Sept. 3rd.			Sept. 9, 1894 -	Itching on Sept. 8th, papular rash on face on Sept. 9th.	1st	Face looked like that in acute nephritis.	Cured, duration seven days.

No. 12 and No. 12A.

COMPILATION of RETURNS of NOTIFIED CASES of CERTAIN INFECTIOUS DISEASES, and REGISTERED DEATHS therefrom.

APP. A. No. 12. — Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom.

No. 12.

TABLE showing Quarter by Quarter, during the Year 1893, for REGISTERED DEATHS from the under-mentioned DISEASES, SANITARY DISTRICTS in question.

[The Cases are a Summary of the Weekly Returns of Notifiable Disease Quarterly

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	SMALL-POX.							
			1st Quarter.		2nd Quarter.		3rd Quarter.		4th Quarter.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
I.	London (*Administrative Co.*)	4,232,118	541	38	1,495	100	464	49	323	19
II. South-Eastern.	Croydon	162,695	3	1	17	—	6	—	1	—
	Dover	33,309	2	—	—	—	—	—	—	—
	Eastbourne	34,969	—	—	—	—	—	—	—	—
	Bournemouth	37,781	—	—	1	—	3	1	—	—
	Southampton	65,325	82	6	37	3	6	—	—	—
	Reading	50,054	2	—	22	—	1	—	—	—
III. South Midland.	Willesden	61,265	2	1	7	—	—	—	14	—
	Hornsey	44,205	2	—	4	—	1	—	4	—
	Tottenham	71,343	3	—	17	—	42	2	1	—
	Oxford	49,742	2	—	2	—	—	—	—	—
	Northampton	61,012	21	—	15	—	—	—	—	—
	Cambridge	36,983	1	—	4	—	—	—	—	—
	Leyton	63,056	3	—	5	—	—	—	2	1
IV. Eastern.	Walthamstow	46,346	—	—	7	—	—	—	—	—
	West Ham	204,903	28	3	173	13	133	27	96	12
	Colchester	34,559	—	—	—	—	—	—	—	—
	Norwich	100,970	1	—	—	—	—	—	—	—
V. South-Western.	Exeter	37,404	4	—	2	—	—	—	—	—
	Plymouth	84,248	—	—	1	—	—	—	—	—
	Devonport	54,803	1	—	4	—	—	—	—	—
	Bath	51,844	—	—	—	—	—	—	11	3
VI. West Midland.	Bristol	221,578	11	1	18	1	5	—	133	15
	St. George	36,718	—	—	6	1	34	3	33	2
	Gloucester	39,444	1	—	2	—	—	—	—	—
	Burton-on-Trent	46,047	7	—	7	1	2	—	—	—
	Wolverhampton	82,662	2	—	3	—	—	—	3	1
	Walsall	71,789	1	—	14	—	174	13	579	54
	West Bromwich	59,474	1	—	3	—	—	—	22	6
	Worcester	42,903	9	—	1	—	—	—	5	1
	Smethwick	36,170	1	—	10	—	1	—	9	—
	Birmingham	478,113	35	—	246	19	118	9	382	43
	Aston Manor	68,639	3	—	21	1	5	—	97	—
	Coventry	52,724	9	—	19	—	—	—	—	—
VII. North Midland.	Leicester	174,624	102	4	117	5	45	2	21	4
	Grimsby	51,934	2	1	—	—	—	—	—	—
	Nottingham	213,877	31	2	17	1	—	—	7	1
	Derby	94,146	28	4	13	2	4	—	7	1

No. 12.

Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom

l URBAN SANITARY DISTRICTS, the Number of NOTIFIED CASES and of with an ANNUAL SUMMARY of these data for each of the URBAN

y the Board from Medical Officers of Health. The Deaths are extracted from the ie Registrar-General.]

SMALL-POX—*continued.*

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	1st Quarter.		2nd Quarter.		3rd Quarter.		4th Quarter.		Total for 1893.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
VIII. North-Western.	Stockport	70,263	23	2	5	—	1	—	—	—	29	2
	Macclesfield	36,000	6	—	—	—	—	—	—	—	6	—
	Birkenhead	99,857	5	—	6	1	2	—	2	—	15	1
	Wallasey	33,229	—	—	1	—	—	—	—	—	1	—
	Liverpool	517,980	40	6	27	1	1	—	7	2	75	9
	St. Helens (Lancs.)	71,288	33	5	4	—	1	—	—	—	38	5
	Southport	41,403	—	—	4	—	2	—	4	—	10	—
	Wigan	55,013	6	—	7	—	—	—	—	—	13	—
	Warrington	52,743	112	11	71	5	3	1	—	—	186	17
	Bolton	115,002	16	4	16	1	—	1	9	1	41	7
	Bury (Lancs)	57,212	5	—	6	—	—	—	—	—	11	—
	Salford	198,139	83	7	63	11	31	4	—	—	177	22
	Manchester	505,368	393	28	217	17	15	3	4	—	629	48
	Ashton-under-Lyne	40,463	1	—	7	—	11	—	1	—	20	—
	Oldham	131,463	163	21	161	30	52	8	39	6	415	65
	Accrington	38,603	1	—	3	—	1	—	—	—	5	—
	Burnley	87,016	23	2	43	4	—	—	—	—	66	6
	Blackburn	120,064	36	—	29	2	8	2	—	—	73	4
	Darwen	34,192	2	—	3	—	—	—	—	—	5	—
	Preston	107,573	2	—	1	—	—	—	—	—	3	—
	Barrow-in-Furness	51,712	1	—	6	1	—	—	—	—	7	1
IX. Yorkshire.	Huddersfield	95,420	22	—	16	—	8	—	1	—	47	—
	Halifax	89,832	95	13	222	22	13	—	3	—	333	35
	Bradford	216,361	33	3	229	19	286	31	452	62	1,000	115
	Wakefield	33,146	100	9	79	2	50	7	60	7	289	25
	Barnsley	35,427	24	4	2	2	—	—	—	—	26	6
	Sheffield	324,243	39	1	54	4	9	—	—	—	102	5
	Rotherham	42,061	40	2	10	—	—	—	1	—	51	2
	York	67,004	34	4	30	2	3	—	—	—	67	6
	Hull	200,044	56	2	101	6	20	—	1	—	178	8
	Middlesbrough	75,532	22	2	38	4	12	1	14	—	86	7
X. Northern.	Darlington	38,060	1	—	1	—	—	—	—	—	2	—
	Hartlepool	21,271	3	—	—	—	—	—	—	—	3	—
	West Hartlepool	42,710	8	—	—	—	—	—	—	—	8	—
	Sunderland	131,015	14	3	18	1	2	1	2	—	36	5
	South Shields	78,391	7	2	37	3	1	—	—	—	45	5
	Newcastle-on-Tyne	186,300	6	—	10	—	8	—	—	—	24	—
	Tynemouth	46,588	4	—	1	—	21	2	1	—	27	2
	Carlisle	30,176	8	1	3	—	—	—	—	—	11	1
XI. Welsh.	Newport (Mon.)	54,707	4	—	1	—	—	—	—	—	5	—
	Cardiff	128,915	4	—	—	—	—	—	—	—	4	—
	Merthyr Tydfil	58,080	1	—	—	—	—	—	—	—	1	—
	Swansea	90,349	17	—	4	—	1	—	1	—	23	—
	Totals, 81 Districts	11,894,990	2,434	193	3,846	235	1,906	167	2,552	241	10,438	836

App. A. No. 12.

Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Scarlet Fever. 1st Quarter. Cases.	1st Quarter. Deaths.	2nd Quarter. Cases.	2nd Quarter. Deaths.	3rd Quarter. Cases.	3rd Quarter. Deaths.	4th Quarter. Cases.	4th Quarter. Deaths.	Total for 19[illegible] Cases.	Total for 19[illegible] [illegible]
I.	London (*Admin. Co.*)	4,232,118	4,943	335	7,779	336	12,718	428	11,409	467	36,849	1,5[illegible]
II. South-Eastern.	Croydon	102,695	70	4	163	3	143	—	234	4	610	[illegible]
	Dover	33,300	14	1	14	—	7	—	11	—	46	[illegible]
	Eastbourne	34,969	11	1	60	2	99	3	49	1	219	[illegible]
	Bournemouth	37,781	37	2	69	4	137	4	68	3	311	[illegible]
	Southampton	65,325	12	—	35	1	31	1	18	2	96	[illegible]
	Reading	60,054	31	—	39	—	70	—	73	1	213	[illegible]
III. South Midland.	Willesden	61,265	130	6	170	5	134	5	158	—	592	[illegible]
	Hornsey	44,205	47	3	100	2	90	2	129	7	367	[illegible]
	Tottenham	71,343	134	6	193	2	158	18	176	3	661	[illegible]
	Oxford	45,742	32	2	57	1	67	2	102	1	259	[illegible]
	Northampton	61,012	59	—	54	1	46	2	50	1	209	[illegible]
	Cambridge	36,983	25	—	37	—	44	—	42	2	148	[illegible]
	Leyton	63,056	107	2	117	15	149	6	106	4	479	[illegible]
IV. Eastern.	Walthamstow	46,340	77	4	157	7	177	5	188	4	603	[illegible]
	West Ham	204,905	472	23	514	17	646	25	553	14	2,185	[illegible]
	Colchester	34,559	78	4	45	2	39	—	32	3	194	[illegible]
	Norwich	100,970	103	1	103	5	211	7	246	7	663	[illegible]
V. South-Western.	Exeter	37,404	117	1	133	1	185	2	326	5	761	[illegible]
	Plymouth	84,248	158	11	69	2	84	2	156	7	467	[illegible]
	Devonport	54,803	80	7	46	2	36	1	69	2	231	[illegible]
	Bath	51,844	62	2	120	6	72	2	52	—	308	[illegible]
VI. West Midland.	Bristol	221,578	244	9	245	7	342	8	434	11	1,265	[illegible]
	St. George	36,718	59	5	33	2	38	2	62	4	196	[illegible]
	Gloucester	39,444	67	—	71	1	71	1	76	3	293	[illegible]
	Burton-on-Trent	46,047	68	3	64	—	60	—	184	2	376	[illegible]
	Wolverhampton	82,602	63	1	98	2	151	6	294	17	606	[illegible]
	Walsall	71,789	139	4	114	4	75	4	98	4	429	[illegible]
	West Bromwich	59,474	50	7	69	4	71	2	73	2	263	[illegible]
	Worcester	42,908	35	—	74	8	94	2	73	—	276	[illegible]
	Smethwick	36,170	111	—	49	—	32	1	64	2	256	[illegible]
	Birmingham	478,113	278	9	451	22	435	20	452	17	1,616	[illegible]
	Aston Manor	68,639	44	3	61	2	63	—	49	—	217	[illegible]
	Coventry	52,724	8	—	11	—	6	—	9	—	34	[illegible]
VII. North Midland.	Leicester	174,624	424	8	657	21	775	27	483	24	2,339	[illegible]
	Grimsby	51,934	25	—	66	3	25	1	89	2	206	[illegible]
	Nottingham	213,877	226	14	254	11	431	18	557	38	1,468	[illegible]
	Derby	94,146	95	2	99	4	194	6	112	2	500	[illegible]

Compilation Returns of Notified In tious Disea and registe Deaths the from.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Scarlet Fever—*continued.* 1st Quarter. Cases.	1st Quarter. Deaths.	2nd Quarter. Cases.	2nd Quarter. Deaths.	3rd Quarter. Cases.	3rd Quarter. Deaths.	4th Quarter. Cases.	4th Quarter. Deaths.	Total for 1893. Cases.	Total for 1893. Deaths.
VIII. North-Western.	Stockport	70,263	43	—	53	2	85	7	74	5	255	14
	Macclesfield	36,000	56	3	55	2	85	4	55	3	251	12
	Birkenhead	90,857	78	2	134	5	62	3	143	2	417	12
	Wallasey	33,229	21	—	15	2	19	—	65	—	120	2
	Liverpool	517,980	507	48	728	48	875	43	1,445	92	3,555	231
	St. Helens (Lancs.)	71,288	88	1	33	2	29	2	89	2	239	7
	Southport	41,406	24	1	50	2	33	1	104	5	211	9
	Wigan	55,013	55	5	100	15	108	17	71	8	334	45
	Warrington	52,743	78	4	77	10	98	15	106	13	359	42
	Bolton	115,002	202	11	253	10	176	10	96	3	727	34
	Bury (Lancs.)	57,212	92	2	109	3	73	4	86	4	360	13
	Salford	198,139	232	16	173	3	240	15	219	7	864	41
	Manchester	505,368	383	47	448	35	549	24	654	32	2,034	138
	Ashton-under-Lyne	40,463	14	1	33	4	54	1	67	3	168	9
	Oldham	131,463	172	5	105	7	85	1	80	3	442	16
	Accrington	38,603	5	—	4	1	11	—	14	—	34	1
	Burnley	87,016	107	3	257	13	376	16	348	19	1,088	51
	Blackburn	120,064	54	1	73	3	38	1	29	—	194	5
	Darwen	34,192	35	1	69	3	33	1	99	4	236	9
	Preston	107,573	135	11	103	7	79	2	112	7	429	27
	Barrow-in-Furness	51,712	100	3	260	3	111	5	116	3	587	14
IX. Yorkshire.	Huddersfield	95,420	84	4	191	6	130	6	182	9	587	25
	Halifax	89,832	50	—	52	1	40	1	17	1	159	3
	Bradford	216,361	247	19	218	16	683	29	297	12	1,445	70
	Wakefield	33,146	33	—	21	1	18	1	8	—	80	2
	Barnsley	35,427	83	6	122	12	52	5	24	6	281	29
	Sheffield	324,243	445	19	643	25	414	28	316	18	1,818	90
	Rotherham	42,061	15	1	18	2	17	—	21	2	71	5
	York	67,004	24	—	55	—	39	1	42	1	160	2
	Hull	200,044	159	6	188	9	164	6	255	12	766	33
	Middlesbrough	75,532	23	—	106	1	128	5	164	—	421	6
X. Northern.	Darlington	38,060	45	1	28	—	6	1	13	—	92	2
	Hartlepool	21,271	7	2	10	4	7	1	5	—	29	7
	West Hartlepool	42,710	35		33		21		45	—	134	
	Sunderland	131,015	188	5	163	6	227	5	381	10	959	26
	South Shields	78,391	109	10	108	8	165	7	218	20	600	45
	Newcastle-on-Tyne	186,300	212	6	124	4	127	5	223	8	686	23
	Tynemouth	46,588	70	3	55	1	35	—	57	3	217	7
	Carlisle	39,176	20	1	13	—	52	3	99	9	184	13
XI. Welsh.	Newport (Mon.)	54,707	259	13	182	2	149	1	99	3	689	19
	Cardiff	128,915	191	8	237	16	197	4	192	11	817	39
	Merthyr Tydfil	58,080	126	4	211	7	120	4	122	2	579	17
	Swansea	90,349	320	14	229	8	183	3	340	8	1,072	33
	Totals, 81 Districts	11,894,990	13,961	768	18,629	808	24,398	931	24,630	1,021	81,618	3,528

Art. 1. No. 2. — Completion of Returns of Certified Schools, Home Districts, and registered Practitioners' Districts.

In Registration Divisions	Urban Sanitary Districts.	Population (1881).	1st Quarter.		2nd Quarter.		3rd Quarter.		4th Quarter.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
I.	London - - (Metrop. Co.)	4,282,759	1,071	626	2,042	677	2,057	669	4,756	1,486
II. South Eastern.	Croydon -	102,696	29	24	71	28	69	27	113	37
	Dover -	42,388	2	1	3	—	3	3	1	1
	Eastbourne -	34,949	3	2	16	1	13	3	13	1
	Hastings -	67,791	4	1	2	2	1	2	3	—
	Southampton -	62,255	7	—	7	—	27	2	10	—
	Reading -	60,364	2	2	3	3	7	2	6	2
III. South Midland.	Willesden -	45,252	40	20	70	9	56	19	42	9
	Hornsey -	44,376	15	5	25	2	49	7	64	20
	Tottenham -	71,548	25	6	36	12	40	12	52	11
	Oxford -	49,742	20	11	28	7	21	6	11	11
	Northampton -	61,922	4	2	1	2	3	—	2	1
	Cambridge -	39,985	3	—	1	1	2	—	6	4
	Leyton - -	42,906	46	8	71	13	42	7	57	12
IV. Eastern.	Walthamstow -	46,346	34	9	49	11	22	3	31	10
	West Ham -	204,985	95	22	112	21	115	28	133	24
	Colchester -	24,229	8	1	21	—	6	2	6	2
	Norwich -	100,979	23	7	28	3	24	2	21	11
V. South Western.	Exeter - -	37,404	1	—	1	—	5	1	9	1
	Plymouth -	84,240	16	4	17	4	15	3	17	3
	Devonport -	54,893	7	1	6	—	9	—	15	4
	Bath - -	51,844	6	2	11	3	15	1	16	3
VI. West Midland.	Bristol - -	221,578	24	8	29	11	24	11	37	19
	St. George -	36,718	6	1	8	1	1	—	5	2
	Gloucester -	39,444	22	1	10	3	11	3	12	3
	Burton-on-Trent	46,047	16	3	25	2	7	3	7	2
	Wolverhampton	82,662	8	—	3	1	12	2	13	2
	Walsall - -	71,780	2	—	6	1	2	—	6	1
	West Bromwich	59,474	2	—	11	3	4	—	4	1
	Worcester -	42,988	6	1	11	4	10	1	13	4
	Smethwick -	36,170	1	—	4	1	2	—	4	—
	Birmingham -	478,113	61	15	77	13	110	15	85	20
	Aston Manor -	68,639	13	1	17	1	10	1	6	—
	Coventry -	52,724	5	—	—	1	3	—	1	—
VII. North Midland.	Leicester -	174,624	27	2	49	7	41	4	23	7
	Grimsby - -	51,934	25	5	20	4	16	1	56	19
	Nottingham -	213,877	20	4	19	2	16	3	24	6
	Derby - -	94,146	8	4	14	—	10	2	17	1

ban Sanitary Districts.	Population (1891).	DIPHTHERIA—*continued.*									
		1st Quarter.		2nd Quarter.		3rd Quarter.		4th Quarter.		Total for 1893.	
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
kport - -	70,263	22	8	13	5	23	12	5	8	63	33
;lesfield -	36,000	—	1	1	2	2	2	2	1	5	6
enhead -	99,857	8	4	21	7	13	1	32	4	74	16
lasey - -	33,229	7	—	18	8	3	—	10	1	38	9
rpool - -	517,980	59	14	54	8	48	17	76	24	237	63
Helens(Lancs.)	71,288	19	1	7	1	18	5	27	3	71	10
hport - -	41,406	10	3	9	—	12	2	5	2	36	7
an - -	55,013	3	1	5	—	3	3	5	—	16	4
rington -	52,743	10	6	1	2	3	—	2	4	16	12
on - -	115,002	38	4	39	4	29	4	6	—	112	12
y (Lancs.) -	57,212	8	6	7	4	7	1	12	4	34	15
ord - -	198,139	63	20	48	12	45	9	45	17	201	58
ichester -	505,308	103	45	161	47	141	40	138	33	543	165
ton-under-Lyne	40,463	4	2	3	—	5	—	4	3	16	5
nam - -	131,463	6	4	4	5	8	5	7	4	25	18
ington - -	38,603	5	5	6	—	3	—	13	1	27	6
nley - -	57,016	7	4	10	3	7	3	2	4	26	14
kburn - -	120,064	2	—	1	—	—	—	1	2	4	2
wen - -	34,192	1	3	3	3	—	—	1	—	5	6
ton - -	107,573	14	7	6	—	6	3	5	4	31	14
ow-in-Furness	51,712	3	—	14	4	12	7	13	2	42	13
ldersfield -	95,420	7	2	1	1	5	—	2	—	15	3
ifax - -	89,832	13	7	20	10	7	2	13	4	53	23
lford - -	216,361	13	4	14	6	22	5	26	8	75	23
efield - -	33,146	10	2	4	—	5	4	3	3	22	9
sley - -	35,427	18	3	25	1	16	1	18	—	77	5
field - -	324,243	44	12	34	17	24	8	30	24	132	61
herham -	42,061	—	2	—	—	4	2	5	—	9	4
k - -	67,004	7	1	5	—	3	1	13	5	28	7
l - - -	200,044	21	5	22	6	27	2	33	9	103	22
dlesbrough -	75,532	8	4	6	2	6	4	12	1	32	11
lington - -	38,060	5	1	1	—	1	1	1	—	8	2
tlepool - -	21,271	—	} 1	1	} 3	5	} —	6	} 2	12	} 6
t Hartlepool -	42,710	1		5		1		3		10	
derland -	131,015	9	3	4	1	2	5	6	2	21	11
th Shields -	78,391	13	7	12	5	15	2	15	2	55	16
castle-on-Tyne	186,300	46	6	27	3	35	9	56	13	164	31
emouth -	46,588	10	1	4	—	2	—	9	—	25	1
isle - -	39,176	24	8	18	2	15	3	14	3	71	16
port (Mon.) -	54,707	17	6	12	1	13	5	7	4	49	16
liff - -	128,915	136	39	135	28	91	17	91	14	453	98
thyr Tydfil -	58,080	40	4	54	4	20	2	24	8	138	18
nsea - -	90,349	7	1	6	2	4	2	4	—	21	5
als, 81 Districts	11,894,990	3,493	1,048	4,562	1,061	5,471	1,210	6,059	1,559	19,585	4,878

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	"Fever."							
			1st Quarter.					2nd Qu		
			Notifications.					Notificatio		
			Typhus.	Enteric.	Continued.	Total.	Deaths.	Typhus.	Enteric.	Continued.
I.	London (*Administrative Co.*)	4,232,118	5	541	37	583	165		735	8
II. South-Eastern.	Croydon	102,695	—	6	—	6	—	—	8	1
	Dover	33,309	—	2	—	2	—	—	1	—
	Eastbourne	34,969	—	6	—	6	1	—	—	—
	Bournemouth	37,781	—	2	—	2	—	—	6	—
	Southampton	65,325	—	10	—	10	1	—	28	—
	Reading	60,054	14	3	—	17	6	—	3	—
III. South Midland.	Willesden	61,265	1	4	—	5	1	—	8	—
	Hornsey	44,205	—	4	—	4	—	—	5	—
	Tottenham	71,345	—	19	1	20	4	—	16	—
	Oxford	45,742	—	3	—	3	—	—	3	—
	Northampton	61,012	—	4	—	4	1	—	5	—
	Cambridge	30,983	—	8	—	8	2	1	8	—
	Leyton	63,036	—	6	2	8	1	—	22	2
IV. Eastern.	Walthamstow	46,346	—	4	—	4	—	—	13	—
	West Ham	204,903	—	30	—	30	8	1	49	3
	Colchester	34,559	—	4	6	10	—	—	5	5
	Norwich	100,970	—	21	—	21	4	—	40	—
V. South-Western.	Exeter	37,404	—	20	1	21	4	—	8	—
	Plymouth	84,248	—	7	—	7	4	—	11	—
	Devonport	54,803	—	6	—	6	—	—	12	—
	Bath	51,844	—	1	—	1	2	—	9	—
VI. West Midland.	Bristol	221,578	—	31	—	31	11	—	33	2
	St. George	36,718	1	14	2	17	2	—	7	—
	Gloucester	39,444	—	5	—	5	—	—	5	—
	Burton-on-Trent	46,047	—	9	—	9	2	—	5	—
	Wolverhampton	82,662	—	27	—	27	4	—	21	1
	Walsall	71,789	—	18	—	18	4	—	7	—
	West Bromwich	59,474	—	13	—	13	—	—	13	—
	Worcester	42,908	—	24	—	24	1	—	5	—
	Smethwick	36,170	—	3	—	3	—	—	1	—
	Birmingham	478,113	—	100	—	100	20	—	88	11
	Aston Manor	68,639	—	18	—	18	1	—	18	1
	Coventry	52,724	—	15	2	17	2	—	8	—
VII. North Midland.	Leicester	174,624	—	26	—	26	3	—	44	—
	Grimsby	51,934	—	13	9	22	4	—	19	7
	Nottingham	213,877	—	86	—	86	12	—	53	—
	Derby	94,146	—	13	—	13	3	—	11	—

FEVER.

Quarter.			4th Quarter.					Totals for 1893.					
tions.			Notifications.					Notifications.					Urban Sanitary Districts.
Continued.	Total.	Deaths.	Typhus.	Enteric.	Continued.	Total.	Deaths.	Typhus.	Enteric.	Continued.	Grand Total.	Deaths.	
52	1,097	219	4	1,350	73	1,427	273	23	3,663	205	3,893	719	London. (*Admin. Co.*)
—	15	4	—	8	—	8	6	—	37	2	39	12	Croydon.
—	3	2	—	7	—	7	—	—	13	—	13	3	Dover.
—	8	1	—	2	—	2	1	—	16	—	16	3	Eastbourne.
1	1	—	—	4	—	4	—	—	12	1	13	2	Bournemouth.
—	29	5	—	41	—	41	9	—	107	—	107	20	Southampton.
—	7	3	—	8	—	8	3	14	21	—	35	14	Reading.
—	19	2	—	16	—	16	4	1	47	—	48	8	Willesden.
—	12	2	—	4	1	5	3	—	25	1	26	7	Hornsey.
—	38	8	—	70	—	70	9	—	143	1	144	24	Tottenham.
—	10	1	1	2	—	3	—	1	18	—	19	2	Oxford.
—	12	2	—	14	—	14	3	—	35	—	35	6	Northampton.
1	20	6	—	10	—	10	2	1	45	1	47	12	Cambridge.
2	46	10	—	32	—	32	2	—	104	6	110	17	Leyton.
1	17	3	—	23	—	23	6	—	56	1	57	10	Walthamstow.
2	123	24	—	154	4	158	26	1	359	11	371	68	West Ham.
5	11	2	—	3	6	9	1	—	18	22	40	4	Colchester.
2	151	15	—	104	—	104	15	—	314	2	316	37	Norwich.
—	11	—	—	20	2	22	5	1	58	3	62	10	Exeter.
—	11	3	—	27	—	27	1	—	56	—	56	10	Plymouth.
—	18	1	—	13	—	13	4	—	49	—	49	7	Devonport.
—	2	—	—	1	—	1	1	—	13	—	13	3	Bath.
4	43	5	—	18	—	18	2	—	121	6	127	25	Bristol.
—	10	1	—	3	—	3	—	1	34	2	37	5	St. George.
—	12	1	—	10	—	10	1	—	32	—	32	3	Gloucester.
—	12	3	—	10	—	10	3	—	36	—	36	9	Burton-on-Trent.
—	64	11	—	43	4	47	9	—	155	5	160	23	Wolverhampton.
—	54	8	—	31	—	31	9	—	110	—	110	24	Walsall.
1	40	6	—	27	1	28	8	—	92	2	94	18	West Bromwich.
—	15	1	—	21	—	21	5	—	65	—	65	9	Worcester.
—	30	5	—	12	—	12	4	—	46	—	43	9	Smethwick.
6	164	36	4	153	4	161	29	4	429	21	5[illegible]	98	Birmingham.
5	72	9	—	18	—	18	3	—	121	6	127	18	Aston Manor.
—	10	4	—	5	1	6	2	—	38	3	41	10	Coventry.
—	197	24	—	120	—	120	14	—	387	—	387	46	Leicester.
4	198	23	—	87	19	103	31	—	313	39	352	61	Grimsby.
—	172	19	—	170	—	170	23	—	481	—	481	69	Nottingham.
—	36	6	—	48	—	48	11	—	108	—	108	22	Derby.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	"Fever." 1st Quarter. Notifications. Typhus.	Enteric.	Continued.	Total.	Deaths.	2nd Quarter. Notifications. Typhus.	Enteric.	Continued.
VIII. North-Western.	Stockport	70,263	—	10	—	10	2	—	16	2
	Macclesfield	36,000	—	1	—	1	—	—	3	1
	Birkenhead	99,857	—	31	4	35	5	3	38	—
	Wallasey	33,229	—	11	—	11	2	—	22	—
	Liverpool	517,980	40	183	26	249	36	44	208	11
	St. Helens (Lancs.)	71,288	—	38	—	38	11	—	15	—
	Southport	41,406	—	7	—	7	—	—	7	—
	Wigan	55,013	1	11	7	19	—	—	12	1
	Warrington	22,743	—	3	—	3	2	—	—	—
	Bolton	115,002	1	47	—	48	14	—	17	1
	Bury (Lancs.)	57,212	—	9	2	11	3	—	10	—
	Salford	198,139	—	73	2	75	14	1	61	1
	Manchester	505,368	1	115	—	116	26	—	76	—
	Ashton-under-Lyne	40,463	—	14	1	15	4	—	9	1
	Oldham	131,483	—	28	—	28	10	—	9	—
	Accrington	38,603	—	1	1	2	—	—	8	—
	Burnley	87,016	—	32	—	32	4	3	34	1
	Blackburn	120,064	—	32	—	32	8	1	38	—
	Darwen	34,102	—	9	—	9	2	—	8	—
	Preston	107,573	—	24	—	24	6	—	16	—
	Barrow-in-Furness	51,712	—	11	9	20	—	2	12	8
IX. Yorkshire.	Huddersfield	95,420	—	12	—	12	1	—	3	—
	Halifax	89,832	—	20	1	21	6	—	6	—
	Bradford	216,361	—	17	—	17	3	—	14	1
	Wakefield	33,146	—	16	—	16	5	—	3	—
	Barnsley	35,427	—	13	—	13	3	—	19	—
	Sheffield	324,243	—	43	6	49	13	—	40	7
	Rotherham	42,031	—	10	—	10	2	2	9	—
	York	67,004	—	15	—	15	2	—	14	1
	Hull	200,044	—	36	1	37	4	—	30	4
	Middlesbrough	75,532	—	29	—	29	7	—	23	1
X. Northern.	Darlington	38,060	—	4	1	5	—	—	4	1
	Hartlepool	21,271	—	2	—	2	2	—	1	—
	West Hartlepool	42,710	—	3	—	3		—	6	—
	Sunderland	131,015	12	32	16	60	16	3	56	24
	South Shields	78,391	—	18	—	18	11	—	12	1
	Newcastle-on-Tyne	186,300	—	9	1	10	3	3	15	—
	Tynemouth	46,588	—	6	1	7	1	—	7	—
	Carlisle	39,176	—	4	1	5	1	1	6	—
XI. Welsh.	Newport (Mon.)	54,707	4	19	1	24	3	—	21	—
	Cardiff	128,915	33	26	1	60	12	3	17	1
	Merthyr Tydfil	58,080	—	13	—	13	1	—	10	—
	Swansea	90,340	—	20	—	20	—	—	28	—
	Totals, 81 Districts	11,894,990	113	2,183	142	2,438	458	76	2,290	163

"Fever."													
Quarter.			4th Quarter.					Totals for 1893.					Urban Sanitary Districts.
nations.			Notifications.					Notifications.					
Continued.	Total.	Deaths.	Typhus.	Enteric.	Continued.	Total.	Deaths.	Typhus.	Enteric.	Continued.	Grand Total.	Deaths.	
9	163	32	—	60	—	60	17	—	240	12	252	52	Stockport.
1	7	1	—	3	1	4	1	—	13	3	16	3	Macclesfield.
—	76	10	1	80	3	84	8	5	220	7	232	27	Birkenhead.
—	50	6	—	50	—	50	10	—	133	—	133	23	Wallasey.
42	582	92	57	508	30	595	98	182	1,398	113	1,693	269	Liverpool.
2	143	17	—	121	1	122	21	—	315	3	318	50	St. Helens (Lancs.).
—	19	10	—	16	1	17	5	—	49	1	50	15	Southport.
23	126	7	18	134	33	185	29	19	260	72	351	36	Wigan.
—	17	8	—	22	—	22	6	—	42	—	42	16	Warrington.
—	55	12	—	41	—	41	5	1	160	1	162	36	Bolton.
3	30	4	—	29	3	32	3	—	75	8	83	11	Bury (Lancs.).
8	251	34	—	179	3	182	40	1	556	15	572	100	Salford.
—	206	28	—	220	—	220	45	2	616	—	618	129	Manchester.
2	23	5	—	12	2	14	2	—	56	7	63	12	Ashton-under-Lyne.
—	20	4	—	13	—	13	10	—	70	—	70	26	Oldham.
—	17	2	—	26	—	26	4	—	52	1	53	6	Accrington.
—	37	12	2	27	—	29	6	6	129	2	137	28	Burnley.
—	46	8	—	41	—	41	7	1	157	—	158	30	Blackburn.
—	9	—	—	4	—	4	2	—	30	—	30	7	Darwen.
—	99	27	—	56	—	56	15	—	195	—	195	51	Preston.
8	37	3	—	20	9	29	9	2	72	34	108	13	Barrow-in-Furness.
—	21	4	—	21	—	21	7	—	57	—	57	12	Huddersfield.
2	17	4	—	28	1	29	2	—	69	4	73	13	Halifax.
1	82	14	—	101	3	104	24	—	213	5	218	49	Bradford.
—	7	2	—	33	—	33	6	—	59	—	59	13	Wakefield.
6	79	19	—	116	8	124	22	—	221	14	235	46	Barnsley.
7	181	28	—	195	15	210	38	—	452	35	487	90	Sheffield.
—	22	12	1	24	—	25	7	3	65	—	68	23	Rotherham.
—	163	19	—	96	—	96	16	—	287	1	288	40	York.
17	335	39	—	270	18	288	51	—	654	40	694	99	Hull.
2	66	15	—	125	2	127	22	—	241	5	246	52	Middlesbrough.
8	82	7	—	58	1	59	8	—	140	11	151	17	Darlington.
1	6	4	—	7	3	10	7	—	15	4	19	15	Hartlepool.
—	17		—	23	—	23		—	49	—	49		West Hartlepool.
44	438	46	7	339	33	379	59	35	808	117	960	131	Sunderland.
4	94	21	—	52	3	55	35	—	172	8	180	77	South Shields.
5	58	7	1	65	3	69	11	4	140	9	153	25	Newcastle-on-Tyne.
—	26	3	—	29	—	29	12	—	68	1	69	18	Tynemouth.
—	4	2	—	6	—	6	—	1	20	1	22	6	Carlisle.
1	71	7	—	22	5	27	1	4	132	7	143	16	Newport (Mon.).
1	38	5	1	23	—	24	6	37	103	3	143	27	Cardiff.
—	33	9	—	37	2	39	3	—	93	2	95	14	Merthyr Tydfil.
—	25	4	—	37	—	37	12	—	110	—	110	19	Swansea.
283	6,671	1,068	97	6,058	298	,458	1,222	352	16,853	886	18,091	3,194	Totals, 81 Districts.

No. 12A.

RATIVE COUNTY of LONDON and for the COUNTY as a WHOLE, the NUMBER of NOTIFIED .Y and ANNUAL SUMMARIES of these Data for each of the AREAS in question.

oard. The Deaths are extracted from the Weekly Returns compiled by the Registrar-General.]

SMALL-POX—*continued.*

Weekly Statement, 1st Quarter, 1893—*continued.*												Totals for 1st Quarter, 1893.		Sanitary Areas.
Feb. 25.		March 4.		March 11.		March 18.		March 25.		April 1.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
53	3	55	4	55	5	56	2	90	5	58	5	559	31	London.
53	—	*49*	—	*53*	—	*54*	—	*87*	—	*59*	—	*541*	—	*(Administrative County.)*
5	—	—	—	—	1	—	—	1	—	—	—	6	2	Kensington.
1	—	—	—	1	—	1	—	1	—	4	—	8	—	Fulham.
—	1	—	—	—	—	3	1	—	—	—	—	3	2	Hammersmith.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	Paddington.
—	—	—	—	—	—	—	—	1	—	—	—	7	—	Chelsea.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	St. George, Hanover Sq.*
—	—	2	—	—	—	1	—	7	—	3	—	19	—	Westminster.
—	—	—	—	—	—	—	—	1	—	1	—	2	—	St. James, Westminster.
1	1	2	—	2	—	4	—	9	—	4	—	34	1	St. Marylebone.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	Hampstead.
1	—	—	—	2	—	4	—	3	—	4	—	22	1	St. Pancras.
3	—	4	—	11	—	2	—	10	—	2	—	49	—	Islington.
1	—	—	—	—	—	4	—	3	—	—	—	18	1	Hackney.
—	—	4	—	1	1	5	—	1	—	2	1	20	2	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	1	—	—	—	1	—	St. Martin-in-the-Fields.
—	—	—	—	1	—	—	—	2	—	—	—	4	—	Strand.†
—	—	—	—	—	—	—	—	—	—	1	1	2	1	Holborn.‡
1	—	—	—	1	—	1	—	—	—	3	—	7	—	Clerkenwell.
1	—	—	—	—	1	—	—	—	—	—	—	3	1	St. Luke, Middlesex.
1	1	—	—	1	—	1	—	2	—	—	—	5	1	London, City of.§
2	—	2	1	—	—	1	—	—	—	1	1	9	2	Shoreditch.
1	—	—	—	—	—	—	—	1	—	1	—	5	—	Bethnal Green.
4	—	1	—	10	1	4	—	10	—	1	—	45	2	Whitechapel.‖
6	—	5	—	—	—	1	—	1	—	—	1	29	1	St. George-in-the-East.
3	—	2	—	1	—	—	—	6	1	1	—	17	1	Limehouse.
—	—	—	—	2	—	2	—	2	—	3	—	11	—	Mile End Old Town.
7	—	16	—	2	—	4	—	4	—	3	—	47	—	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. Saviour, Southwark.
1	—	2	—	—	—	—	—	1	—	1	—	9	—	St. George, Southwark.
—	—	—	—	—	—	2	—	—	—	2	—	9	1	Newington.
—	—	5	1	—	—	—	—	—	—	—	—	6	1	St. Olave, Southwark.
—	—	1	—	5	—	—	1	1	—	—	—	12	1	Bermondsey.
1	—	—	—	—	—	2	—	—	—	—	—	4	—	Rotherhithe.
1	—	—	—	2	1	1	—	—	—	—	—	8	1	Lambeth.
1	—	1	—	1	—	—	—	1	—	1	—	5	—	Battersea.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	Wandsworth.
8	—	2	1	1	—	1	—	3	1	1	—	40	3	Camberwell.
1	—	4	1	4	—	4	—	16	2	9	1	47	5	Greenwich.
—	—	—	—	—	—	2	—	—	1	5	—	10	1	Lewisham.
1	—	1	—	6	—	5	—	2	—	4	—	19	—	Woolwich.
1	—	—	—	1	—	1	—	—	—	1	—	7	—	Plumstead.
—	—	1	—	—	—	—	—	—	—	—	—	6	—	Port of London.

ding Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple
1 (population, 21), and Furnival's Inn (population, 121).
ling Inner Temple (population, 96). ‖ Including Tower of London (population, 968).

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	"Fever." 1st Quarter. Notifications. Typhus.	Enteric.	Continued.	Total.	Deaths.	2nd Qu Notifications. Typhus.	Enteric.	Continued.
I.	London (*Administrative Co.*)	4,232,118	5	541	37	583	105		735	42
II. South-Eastern.	Croydon	102,695	—	6	—	6	—	—	8	2
	Dover	33,300	—	2	—	2	—	—	1	—
	Eastbourne	34,969	—	6	—	6	1	—	—	—
	Bournemouth	37,781	—	2	—	2	—	—	6	—
	Southampton	65,325	—	10	—	10	1	—	28	—
	Reading	60,054	14	3	—	17	6	—	3	—
III. South Midland.	Willesden	61,265	1	4	—	5	1	—	8	—
	Hornsey	44,205	—	4	—	4	—	—	5	—
	Tottenham	71,343	—	19	1	20	4	—	16	—
	Oxford	45,742	—	3	—	3	—	—	3	—
	Northampton	61,012	—	4	—	4	1	—	5	—
	Cambridge	36,983	—	8	—	8	2	1	8	—
	Leyton	63,056	—	6	2	8	1	—	22	1
IV. Eastern.	Walthamstow	46,346	—	4	—	4	—	—	13	—
	West Ham	204,903	—	30	—	30	8	1	42	5
	Colchester	34,559	—	4	6	10	—	—	5	5
	Norwich	100,970	—	21	—	21	4	—	40	—
V. South-Western.	Exeter	37,404	—	20	1	21	4	—	8	—
	Plymouth	84,248	—	7	—	7	4	—	11	—
	Devonport	54,803	—	6	—	6	—	—	12	—
	Bath	51,844	—	1	—	1	2	—	9	—
VI. West Midland.	Bristol	221,578	—	31	—	31	11	—	33	2
	St. George	36,718	1	14	2	17	2	—	7	—
	Gloucester	39,444	—	5	—	5	—	—	5	—
	Burton-on-Trent	46,047	—	9	—	9	2	—	5	—
	Wolverhampton	82,662	—	27	—	27	4	—	21	1
	Walsall	71,789	—	18	—	18	4	—	7	—
	West Bromwich	59,474	—	13	—	13	—	—	13	—
	Worcester	42,908	—	24	—	24	1	—	5	—
	Smethwick	36,170	—	3	—	3	—	—	1	—
	Birmingham	478,113	—	100	—	100	20	—	88	11
	Aston Manor	68,639	—	18	—	18	1	—	18	1
	Coventry	52,724	—	15	2	17	2	—	8	—
VII. North Midland.	Leicester	174,624	—	26	—	26	3	—	44	—
	Grimsby	51,934	—	13	9	22	4	—	19	7
	Nottingham	213,877	—	86	—	86	12	—	53	—
	Derby	94,146	—	13	—	13	3	—	11	—

"Fever."														Urban Sanitary Districts.
3rd Quarter.				4th Quarter.					Totals for 1893.					
Notifications.				Notifications.					Notifications.					
Enteric.	Continued.	Total.	Deaths.	Typhus.	Enteric.	Continued.	Total.	Deaths.	Typhus.	Enteric.	Continued.	Grand Total.	Deaths.	
1,037	52	1,097	219	4	1,350	73	1,427	273	25	3,063	205	3,293	719	London. (*Admin. Co.*)
15	—	15	4	—	8	—	8	6	—	37	2	39	12	Croydon.
3	—	3	2	—	7	—	7	—	—	13	—	13	3	Dover.
8	—	8	1	—	2	—	2	1	—	16	—	16	3	Eastbourne.
—	1	1	—	—	4	—	4	—	—	12	1	13	2	Bournemouth.
28	—	28	5	—	41	—	41	9	—	107	—	107	20	Southampton.
7	—	7	3	—	8	—	8	3	14	21	—	35	14	Reading.
19	—	19	2	—	16	—	16	4	1	47	—	48	8	Willesden.
12	—	12	2	—	4	1	5	3	—	25	1	26	7	Hornsey.
38	—	38	8	—	70	—	70	9	—	143	1	144	24	Tottenham.
10	—	10	1	1	2	—	3	—	1	18	—	19	2	Oxford.
12	—	12	2	—	14	—	14	3	—	35	—	35	6	Northampton.
19	1	20	6	—	10	—	10	2	1	45	1	47	12	Cambridge.
41	2	46	10	—	32	—	32	2		104	6	110	17	Leyton.
16	1	17	3	—	23	—	23	6		56	1	57	10	Walthamstow.
126	2	128	24	—	154	4	158	26		359	11	371	68	West Ham.
6	5	11	2	—	3	6	9	1		18	22	40	4	Colchester.
149	2	151	15	—	104	—	104	15		314	2	316	37	Norwich.
10	—	11	—	—	20	2	22	5	1	58	3	62	10	Exeter.
11	—	11	3	—	27	—	27	1	—	56	—	56	10	Plymouth.
18	—	18	1	—	13	—	13	4	—	49	—	49	7	Devonport.
2	—	2	—	—	1	—	1	1	—	13	—	13	3	Bath.
39	4	43	5	—	18	—	18	2	—	121	6	127	25	Bristol.
10	—	10	1	—	3	—	3	—	1	34	2	37	5	St. George.
12	—	12	1	—	10	—	10	1	—	32	—	32	3	Gloucester.
12	—	12	3	—	10	—	10	3	—	36	—	36	9	Burton-on-Trent.
64	—	64	11	—	43	4	47	9	—	155	5	160	23	Wolverhampton.
54	—	54	8	—	31		31	9		110	—	110	24	Walsall.
39	1	40	6	—	27		28	8		92	2	94	18	West Bromwich.
15	—	15	1	—	21		21	5		65	—	65	9	Worcester.
30	—	30	5	—	12		12	4		46	—	41	9	Smethwick.
158	6	164	36	4	53	4	161	29	4	499	21	524	98	Birmingham.
67	5	72	9	—	18		18	3		121	6	127	18	Aston Manor.
10	—	10	4	—	5	1	6			38	3	41	10	Coventry.
197	—	197	24	—	120		120	14		387	—	387	46	Leicester.
194	4	198	23	—	87	19	106	31		313	39	352	61	Grimsby.
172	—	172	19	—	170		170	23		481	—	481	69	Nottingham.
36	—	36	6	—	48		48	11	—	108	—	108	22	Derby.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	"Fever." 1st Quarter. Notifications. Typhus.	Enteric.	Continued.	Total.	Deaths.	2nd Quarter. Notifications. Typhus.	Enteric.	Continued.
VIII. North-Western.	Stockport	70,263	—	10	—	10	2	—	16	2
	Macclesfield	36,000	—	1	—	1	—	—	3	1
	Birkenhead	99,857	—	31	4	35	5	3	34	—
	Wallasey	33,229	—	11	—	11	2	—	22	—
	Liverpool	517,980	40	183	26	249	36	44	208	15
	St. Helens (Lancs.)	71,288	—	38	—	38	11	—	15	—
	Southport	41,406	—	7	—	7	—	—	7	—
	Wigan	53,013	1	11	7	19	—	—	12	9
	Warrington	52,743	—	3	—	3	2	—	—	—
	Bolton	115,002	1	47	—	48	14	—	17	1
	Bury (Lancs.)	57,212	—	9	2	11	3	—	16	—
	Salford	198,139	—	73	2	75	14	1	61	2
	Manchester	505,368	1	115	—	116	26	—	76	—
	Ashton-under-Lyne	40,463	—	14	1	15	4	—	9	1
	Oldham	131,463	—	28	—	28	10	—	9	—
	Accrington	38,603	—	1	1	2	—	—	8	—
	Burnley	87,016	—	32	—	32	4	3	34	2
	Blackburn	120,064	—	32	—	32	8	1	38	—
	Darwen	34,192	—	9	—	9	2	—	8	—
	Preston	107,573	—	24	—	24	6	—	16	—
	Barrow-in-Furness	51,712	—	11	9	20	—	2	12	8
IX. Yorkshire.	Huddersfield	95,420	—	12	—	12	1	—	3	—
	Halifax	89,832	—	20	1	21	6	—	6	—
	Bradford	216,361	—	17	—	17	3	—	14	1
	Wakefield	33,146	—	16	—	16	5	—	3	—
	Barnsley	35,427	—	13	—	13	3	—	19	—
	Sheffield	324,243	—	43	6	49	13	—	40	7
	Rotherham	42,061	—	10	—	10	2	2	9	—
	York	67,004	—	15	—	15	2	—	14	1
	Hull	200,044	—	36	1	37	4	—	30	4
	Middlesbrough	75,532	—	29	—	29	7	—	23	1
X. Northern.	Darlington	38,060	—	4	1	5	—	—	4	1
	Hartlepool	21,271	—	2	—	2	2	—	1	—
	West Hartlepool	42,710	—	3	—	3		—	6	—
	Sunderland	131,015	12	32	16	60	16	3	56	24
	South Shields	78,391	—	18	—	18	11	—	12	1
	Newcastle-on-Tyne	186,300	—	9	1	10	3	3	13	—
	Tynemouth	46,588	—	6	1	7	1	—	7	—
	Carlisle	39,176	—	4	1	5	1	1	6	—
XI. Welsh.	Newport (Mon.)	54,707	4	19	1	24	3	—	21	—
	Cardiff	128,915	33	26	1	60	12	3	17	1
	Merthyr Tydfil	58,080	—	13	—	13	1	—	10	—
	Swansea	90,349	—	20	—	20	—	—	28	—
	Totals, 81 Districts	11,894,990	113	2,183	142	2,438	458	76	2,290	163

FEVER.

3rd Quarter.				4th Quarter.					Totals for 1866.					
Notifications.				Notifications.					Notifications.					
Enteric.	Continued.	Total.	Deaths.	Typhus.	Enteric.	Continued.	Total.	Deaths.	Typhus.	Enteric.	Continued.	Grand Total.	Deaths.	
154	9	163	32	—	60	—	60	17	—	240	12	252	52	Stockport
6	1	7	1	—	3	1	4	1	—	13	3	16	3	Macclesfi
75	—	76	10	1	80	3	84	8	5	220	7	232	27	Birkenhe
50	—	50	6	—	50	—	50	10	—	133	—	133	23	Wallasey.
499	42	582	92	57	508	30	595	98	182	1,398	113	1,693	269	Liverpool
141	2	143	17	—	121	1	122	21	—	315	3	318	50	St. Helens
19	—	19	10	—	16	1	17	5	—	49	1	50	15	Southport
103	23	126	7	18	134	33	185	29	19	260	72	351	36	Wigan.
17	—	17	8	—	22	—	22	6	—	42	—	42	16	Warrington
55	—	55	12	—	41	—	41	5	1	160	1	162	36	Bolton.
27	3	30	4	—	29	3	32	3	—	75	8	83	11	Bury (La
243	8	251	34	—	179	3	182	40	1	556	15	572	100	Salford.
205	—	206	28	—	220	—	220	45	2	616	—	618	129	Manchest
21	2	23	5	—	12	2	14	2	—	56	7	63	12	Ashton-u
20	—	20	4	—	13	—	13	10	—	70	—	70	26	Oldham.
17	—	17	2	—	26	—	26	4	—	52	1	53	6	Accringto
36	—	37	12	2	27	—	29	6	6	129	2	137	28	Burnley.
46	—	46	8	—	41	—	41	7	1	157	—	158	30	Blackbur
9	—	9	—	—	4	—	4	2	—	30	—	30	7	Darwen.
99	—	99	27	—	56	—	56	15	—	195	—	195	51	Preston.
29	8	37	3	—	20	9	29	9	2	72	34	108	13	Barrow-i
21	—	21	4	—	21	—	21	7	—	57	—	57	12	Huddersf
15	2	17	4	—	28	1	29	2	—	69	4	73	13	Halifax.
81	1	82	14	—	101	3	104	24	—	213	5	218	49	Bradford.
7	—	7	2	—	33	—	33	6	—	59	—	59	13	Wakefield
73	6	79	19	—	116	8	124	22	—	221	14	235	46	Barnsley.
174	7	181	28	—	195	15	210	38	—	452	35	487	90	Sheffield.
22	—	22	12	1	24	—	25	7	3	65	—	68	23	Rotherha
162	—	162	19	—	96	—	16	16	—	287	1	288	40	York.
318	17	335	39	—	270	18	288	51	—	654	40	694	99	Hull.
64	2	66	15	—	125	2	127	22	—	241	5	246	52	Middlesb
74	8	82	7	—	58	1	59	8	—	140	11	151	17	Darlingto
5	1	6	4	—	7	3	10	7	—	15	4	19	15	Hartlep
17	—	17		—	23	—	23		—	49	—	49		West H
381	44	438	46	7	339	33	379	59	35	808	117	960	131	Sunderlan
90	4	94	21	—	52	3	55	35	—	172	8	180	77	South Shi
53	5	58	7	1	65	3	69	11	4	140	9	153	25	Newcastle
26	—	26	3	—	29	—	29	12	—	68	1	69	18	Tynemout
4	—	4	2	—	6	—	6	—	1	20	1	22	6	Carlisle.
70	1	71	7	—	22	5	27	1	4	132	7	143	16	Newport (
37	1	38	5	1	23	—	24	6	37	103	3	143	27	Cardiff.
33	—	33	9	—	37	2	39	3	—	93	2	95	14	Merthyr T
25	—	25	4	—	37	—	37	12	—	110	—	110	19	Swansea.
6,322	283	6,671	1,068	97	6,058	298	,453	1,222	352	16,853	886	18,091	3,194	Totals, 8

No. 12A.

Table showing, Week by Week, during the Year 1893, for each of the Sanitary Area Cases and of Registered Deaths from the following Diseases,

[The Cases are copied from the Weekly Returns of Notifiable Diseases received by the Board from th

Sanitary Areas.		Population (1891).	Small-pox. Weekly Statement, 1st Quarter, 1893. Jan. 7. Cases.	Jan. 7. Deaths.	Jan. 14. Cases.	Jan. 14. Deaths.	Jan. 21. Cases.	Jan. 21. Deaths.	Jan. 28. Cases.	Jan. 28. Deaths.	Feb. 4 Cases.	Feb. 4 Deaths.
London		4,232,118	[a]13	—	22	1	23	1	28	—	31	
(*Administrative County*)		-	[b]*13*	—	*21*	—	*19*	—	*28*	—	*31*	—
W. District.	Kensington	166,308	—	—	—	—	—	—	—	—	—	—
	Fulham	91,639	—	—	—	—	—	—	—	—	—	—
	Hammersmith	97,239	—	—	—	—	—	—	—	—	—	—
	Paddington	117,846	—	—	—	—	—	—	—	—	—	—
	Chelsea	96,253	—	—	2	—	1	—	3	—	—	—
	St. George, Hanover Sq.*	78,599	—	—	—	—	—	—	2	—	—	—
	Westminster	55,539	1	—	2	—	1	—	—	—	—	—
	St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—	—
N. District.	St. Marylebone	142,404	1	—	—	—	1	—	2	—	6	—
	Hampstead	68,416	—	—	—	—	—	—	—	—	—	—
	St. Pancras	234,379	2	—	1	—	3	—	2	—	—	1
	Islington	319,143	2	—	2	—	3	—	3	—	4	—
	Hackney	229,542	—	—	—	—	3	—	1	—	5	1
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	2	—	1	—
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—
	Strand†	25,217	—	—	—	—	—	—	—	—	—	—
	Holborn‡	34,043	—	—	—	—	—	—	—	—	—	—
	Clerkenwell	66,216	—	—	—	—	—	—	—	—	—	—
	St. Luke, Middlesex	42,440	—	—	—	—	—	—	—	—	—	—
	London, City of§	37,583	—	—	—	—	—	—	—	—	—	—
E. District.	Shoreditch	124,009	—	—	—	—	1	—	1	—	—	—
	Bethnal Green	129,132	—	—	—	—	1	—	—	—	—	—
	Whitechapel‖	74,420	—	—	3	—	1	—	4	—	—	1
	St. George-in-the-East	45,795	—	—	1	—	1	—	3	—	1	—
	Limehouse	57,376	—	—	—	—	—	—	—	—	2	—
	Mile End Old Town	107,592	—	—	—	—	—	—	1	—	—	—
	Poplar	166,748	—	—	—	—	—	—	—	—	2	—
S. District.	St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—	—	—
	St. George, Southwark	59,712	1	—	—	—	—	—	1	—	—	—
	Newington	115,804	—	—	1	—	4	1	—	—	—	—
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—
	Bermondsey	84,682	—	—	—	—	1	—	—	—	1	—
	Rotherhithe	39,255	—	—	—	—	—	—	—	—	—	—
	Lambeth	275,203	—	—	2	—	—	—	—	—	2	—
	Battersea	150,558	—	—	—	—	—	—	—	—	—	—
	Wandsworth	156,942	—	—	—	—	—	—	—	—	—	—
	Camberwell	235,344	4	—	4	1	2	—	—	—	3	—
	Greenwich	165,413	—	—	—	—	—	—	—	—	3	1
	Lewisham	92,647	—	—	1	—	—	—	—	—	1	—
	Woolwich	40,848	—	—	—	—	—	—	—	—	—	—
	Plumstead	88,539	—	—	1	—	—	—	2	—	—	—
	Port of London	—	2	—	2	—	—	—	1	—	—	—

[a] Totals of actual *notifications*.
[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (populati

Sanitary Areas.	Population (1891).	SMALL-POX—*continued.* Weekly Statement, 2nd Quarter, 1893.											
		April 8.		April 15.		April 22.		April 29.		May 6.		May	
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	
London	4,232,118	*101	2	155	3	107	8	118	6	169	9	111	
(*Administrative County*)	-	b99	—	151	—	104	—	116	—	166	—	85	
W. District. Kensington	166,308	1	—	1	—	1	—	3	—	2	1	2	
W. District. Fulham	91,639	1	—	2	—	—	—	2	—	2	1	1	
W. District. Hammersmith	97,239	4	—	1	—	1	—	—	—	3	—	1	
W. District. Paddington	117,846	—	—	5	—	2	1	6	—	—	—	1	
W. District. Chelsea	96,253	—	—	3	—	1	—	4	—	3	—	1	
W. District. St. George, Hanover Sq.*	78,599	—	—	2	—	2	1	—	1	1	—	—	
W. District. Westminster	53,539	5	—	2	—	1	—	2	—	4	—	3	
W. District. St. James, Westminster	24,995	—	—	1	—	—	—	2	—	—	—	—	
N. District. St. Marylebone	142,404	1	—	15	—	13	—	9	—	16	—	4	
N. District. Hampstead	68,416	2	—	—	—	1	—	—	—	3	—	1	
N. District. St. Pancras	234,379	1	—	5	—	9	—	4	—	11	—	7	
N. District. Islington	319,143	7	—	13	—	4	—	4	—	5	—	1	
N. District. Hackney	229,542	—	—	3	—	—	—	3	—	2	—	—	
Central District. St. Giles and St. George, Bloomsbury.	39,782	2	—	9	—	2	—	8	—	3	1	1	
Central District. St. Martin-in-the-Fields	14,616	—	—	2	—	1	1	—	1	—	—	—	
Central District. Strand†	25,217	1	—	9	—	2	—	4	—	5	—	—	
Central District. Holborn‡	34,043	1	—	1	—	6	—	—	—	3	—	4	
Central District. Clerkenwell	66,216	1	—	1	—	—	—	—	—	1	—	—	
Central District. St. Luke, Middlesex	42,440	—	—	1	—	—	—	—	—	1	—	1	
Central District. London, City of§	37,583	1	—	1	—	3	—	1	1	1	—	1	
E. District. Shoreditch	124,009	1	—	4	—	—	—	—	—	1	—	—	
E. District. Bethnal Green	129,132	3	—	—	—	1	—	1	—	2	—	1	
E. District. Whitechapel‖	74,420	7	1	4	—	—	2	5	—	9	—	1	
E. District. St. George-in-the-East	45,795	1	—	—	—	2	—	2	—	1	—	—	
E. District. Limehouse	57,376	8	—	5	—	2	—	2	—	6	—	1	
E. District. Mile End Old Town	107,592	11	—	5	—	10	—	5	—	12	1	4	
E. District. Poplar	166,748	9	—	4	—	5	—	5	1	11	—	1	
S. District. St. Saviour, Southwark	27,177	—	—	—	—	1	—	—	—	—	—	—	
S. District. St. George, Southwark	59,712	3	—	3	1	2	—	2	—	2	—	1	
S. District. Newington	115,804	—	—	1	—	—	—	4	—	3	—	1	
S. District. St. Olave, Southwark	12,723	1	—	—	—	—	—	—	—	1	—	—	
S. District. Bermondsey	84,682	—	—	5	—	—	—	4	—	1	1	1	
S. District. Rotherhithe	39,255	—	—	—	—	—	—	14	1	23	1	13	
S. District. Lambeth	275,203	3	—	4	—	4	—	2	—	2	—	4	
S. District. Battersea	150,558	—	—	3	—	1	—	1	1	1	—	1	
S. District. Wandsworth	156,942	—	—	—	—	—	—	1	—	5	—	1	
S. District. Camberwell	235,344	5	—	7	1	9	—	3	—	6	—	1	
S. District. Greenwich	165,413	19	—	26	—	12	3	11	—	7	—	1	
S. District. Lewisham	92,647	1	—	1	1	5	—	—	—	3	2	—	
S. District. Woolwich	40,848	—	—	1	—	2	—	—	—	3	1	1	
S. District. Plumstead	88,539	1	1	5	—	2	—	4	—	3	—	4	
S. District. Port of London	—	—	—	—	—	—	—	—	—	—	—	—	

a Totals of actual *notifications.*
b Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and dele
of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population,

SMALL-POX—*continued.*

Weekly Statement, 2nd Quarter, 1893—*continued.*												Totals for 2nd Quarter, 1893.		Sanitary Areas.
May 27.		June 3.		June 10.		June 17.		June 24.		July 1.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
142	15	139	9	91	6	111	6	100	8	78	3	1,555	90	London.
131	—	*135*	—	*83*	—	*104*	—	*94*	—	*76*	—	*1,495*	—	(*Administrative County.*)
—	1	1	—	—	—	1	—	1	—	—	—	17	2	Kensington.
—	—	2	—	—	—	—	—	1	—	—	—	16	1	Fulham.
—	—	1	—	—	—	—	—	2	—	1	1	14	1	Hammersmith.
8	—	4	1	2	1	—	—	—	—	—	—	32	3	Paddington.
2	—	3	—	1	—	—	—	—	—	1	—	21	—	Chelsea.
3	1	—	—	—	—	2	—	2	—	—	—	14	3	St. George, Hanover Sq.*
—	—	2	—	1	—	2	—	1	—	—	—	25	—	Westminster.
2	—	—	—	4	—	16	—	14	—	7	—	46	—	St. James, Westminster.
17	—	11	2	4	—	5	—	7	—	4	—	123	2	St. Marylebone.
1	1	1	—	—	—	—	—	—	—	—	—	12	2	Hampstead.
7	1	9	—	6	1	5	1	5	1	5	—	79	4	St. Pancras.
4	—	3	—	2	—	2	—	2	—	4	—	59	—	Islington.
1	—	1	—	1	—	2	—	2	—	1	—	19	—	Hackney.
3	—	1	—	6	—	2	—	5	—	1	—	50	2	St. Giles and St. George Bloomsbury.
1	—	1	—	1	—	—	—	1	—	1	—	9	2	St. Martin-in-the-Fields.
—	—	—	—	3	—	1	—	—	—	1	—	26	1	Strand.†
5	—	2	—	—	—	4	—	—	—	—	—	28	—	Holborn.‡
—	—	1	—	—	—	1	—	—	—	—	—	5	—	Clerkenwell.
1	—	2	—	—	—	1	—	3	—	—	—	12	—	St. Luke, Middlesex.
4	—	3	1	—	—	2	—	—	—	1	—	20	2	London, City of.§
—	—	1	—	1	—	—	—	—	—	1	—	13	—	Shoreditch.
4	—	2	—	4	—	1	—	1	1	—	—	23	1	Bethnal Green.
1	—	5	—	3	—	2	—	1	—	1	—	51	3	Whitechapel.‖
1	—	—	—	2	—	2	—	2	—	—	—	15	—	St. George-in-the-East.
7	—	3	—	—	—	3	2	5	—	3	1	49	4	Limehouse.
6	1	4	—	3	—	2	—	6	—	1	—	73	3	Mile End Old Town.
1	2	7	—	5	—	5	—	7	1	8	—	76	6	Poplar.
—	—	—	—	1	—	5	—	—	—	—	—	7	—	St. Saviour, Southwark.
9	2	10	2	5	—	8	—	2	—	3	—	59	5	St. George, Southwark.
1	—	2	—	9	—	11	—	5	1	4	—	50	2	Newington.
—	—	1	—	1	—	—	—	1	—	—	—	6	—	St. Olave, Southwark.
5	—	—	1	2	—	3	—	2	—	3	—	38	2	Bermondsey.
1	4	6	—	—	1	3	—	2	2	1	—	73	12	Rotherhithe.
7	—	8	1	4	—	4	—	4	—	16	—	63	1	Lambeth.
16	—	5	—	11	—	1	1	3	—	9	1	57	4	Battersea.
1	—	5	—	1	—	—	—	1	—	1	—	17	1	Wandsworth.
5	1	11	1	1	2	3	—	5	—	2	—	69	6	Camberwell.
6	—	11	—	4	1	6	1	3	2	3	—	112	7	Greenwich.
—	1	1	—	1	—	—	—	—	—	—	—	14	4	Lewisham.
7	—	2	—	2	—	4	1	1	—	—	—	25	2	Woolwich.
3	—	5	—	—	—	2	—	2	—	—	—	35	2	Plumstead.
2	—	—	—	—	—	—	—	1	—	—	—	3	—	Port of London.

ding Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Stapl
n (population, 21), and Furnival's Inn (population, 121).
cluding Inner Temple (population, 96). ‖ Including Tower of London (population, 968).

	Sanitary Areas.	Population (1891).	SMALL-POX—*continued.* Weekly Statement, 3rd Quarter, 1893.											
			July 8.		July 15.		July 22.		July 29.		Aug. 5.		Au	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	
	London	4,232,118	*75	9	74	3	53	10	48	8	47	3	2	
	(*Administrative County*)	—	†74	—	72	—	53	—	46	—	43	—	2	
W. District.	Kensington	166,308	1	1	1	—	2	—	—	—	1	—	—	
W. District.	Fulham	91,639	1	—	—	—	—	—	—	—	—	—	—	
W. District.	Hammersmith	97,239	1	—	—	—	—	—	—	—	—	—	—	
W. District.	Paddington	117,846	—	—	1	—	2	—	1	—	3	—	1	
W. District.	Chelsea	96,253	1	—	1	—	—	—	—	—	—	—	—	
W. District.	St. George, Hanover Sq.*	78,599	1	—	—	—	1	—	—	—	2	—	—	
W. District.	Westminster	55,539	—	—	—	—	—	—	—	—	—	—	1	
W. District.	St. James, Westminster	24,995	3	—	1	—	1	1	1	—	1	—	—	
N. District.	St. Marylebone	142,404	5	—	1	—	2	—	5	—	6	1	2	
N. District.	Hampstead	68,416	1	—	—	—	—	—	—	—	—	—	—	
N. District.	St. Pancras	234,379	—	1	3	—	1	1	1	—	6	—	1	
N. District.	Islington	319,143	—	—	2	—	5	—	—	2	—	—	—	
N. District.	Hackney	229,542	3	1	6	—	1	1	3	—	2	—	—	
Central District.	St. Giles and St. George, Bloomsbury.	39,782	3	—	2	—	1	—	—	—	—	—	—	
Central District.	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—	—	
Central District.	Strand†	25,217	1	—	—	—	1	—	—	—	1	—	—	
Central District.	Holborn‡	34,043	—	—	1	—	—	—	1	—	1	—	—	
Central District.	Clerkenwell	66,216	—	—	—	—	—	—	2	—	—	—	—	
Central District.	St. Luke, Middlesex	42,440	—	—	1	—	—	—	—	—	—	—	—	
Central District.	London, City of §	37,583	—	—	—	—	—	—	—	—	—	—	—	
E. District.	Shoreditch	124,009	—	—	2	—	1	—	—	—	—	—	—	
E. District.	Bethnal Green	129,132	5	—	6	—	2	1	4	1	8	—	1	
E. District.	Whitechapel‖	74,420	2	—	2	—	—	—	—	—	—	—	—	
E. District.	St. George-in-the-East	45,795	1	—	1	—	—	—	—	—	—	—	—	
E. District.	Limehouse	57,376	2	2	3	—	—	—	—	—	—	—	—	
E. District.	Mile End Old Town	107,592	3	—	2	—	2	—	8	—	1	2	1	
E. District.	Poplar	166,748	2	—	8	—	1	—	1	—	4	—	3	
S. District.	St. Saviour, Southwark	27,177	—	—	1	—	—	—	—	—	—	—	—	
S. District.	St. George, Southwark	59,712	—	1	1	—	3	—	1	1	—	—	—	
S. District.	Newington	115,804	4	—	1	1	2	—	—	—	1	—	4	
S. District.	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—	—	
S. District.	Bermondsey	84,682	2	1	—	—	—	—	1	—	1	—	2	
S. District.	Rotherhithe	39,255	3	—	—	—	5	—	1	1	2	—	—	
S. District.	Lambeth	275,203	4	1	9	—	1	1	4	1	3	—	3	
S. District.	Battersea	150,558	10	—	8	2	14	4	7	1	2	—	4	
S. District.	Wandsworth	156,942	2	—	2	—	1	—	1	—	—	—	2	
S. District.	Camberwell	235,344	6	1	3	—	2	—	3	—	2	—	1	
S. District.	Greenwich	165,413	6	—	4	—	—	1	—	—	—	—	—	
S. District.	Lewisham	92,647	—	—	—	—	—	—	—	—	—	—	—	
S. District.	Woolwich	40,848	1	—	1	—	2	—	—	1	—	—	—	
S. District.	Plumstead	88,539	1	—	—	—	2	—	3	—	—	—	—	
S. District.	Port of London	—	—	—	—	—	—	—	—	—	—	—	—	

* Totals of actual *notifications*.

† Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and d
of duplicate notifications.

‡ Including St. Peters, Westminster (population, 235). † Including Middle Temple (populatio

SMALL-POX—*continued.*

Weekly Statement, 3rd Quarter, 1893—*continued.*														Totals for 3rd Quarter, 1893.		Sanitary Areas.
Aug. 19.		Aug. 26.		Sept. 2.		Sept. 9.		Sept. 16.		Sept. 23.		Sept. 30.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
32	3	29	2	13	2	33	—	26	1	19	2	19	2	496	47	London.
32	—	*24*	—	*12*	—	*28*	—	*25*	—	*17*	—	*18*	—	*464*	—	*(Administrative County.)*
—	—	—	—	—	—	—	—	1	—	—	—	—	—	6	1	Kensington.
—	—	—	—	1	—	—	—	—	—	—	—	2	—	4	—	Fulham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Hammersmith.
1	1	1	—	—	—	—	—	—	—	—	—	1	—	11	1	Paddington.
—	—	—	—	—	—	—	—	1	—	—	—	—	—	3	—	Chelsea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	St. George, Hanover Sq.*
—	—	—	—	—	—	1	—	2	—	—	—	—	—	4	—	Westminster.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	8	1	St. James, Westminster.
1	—	—	1	—	—	—	—	—	—	—	—	—	—	22	2	St. Marylebone.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Hampstead.
—	—	—	—	2	—	—	—	—	—	—	—	—	—	14	2	St. Pancras.
1	—	—	—	3	—	—	—	—	—	—	—	—	—	11	2	Islington.
3	—	—	—	2	—	3	—	1	—	3	—	1	1	28	3	Hackney.
—	—	—	—	—	—	—	—	1	—	—	—	—	—	7	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	Strand.†
—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	Holborn.‡
—	—	2	—	—	—	1	—	—	—	—	—	—	—	5	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	London, City of.§
1	—	—	—	—	—	1	—	2	1	2	—	—	—	9	1	Shoreditch.
1	—	6	—	1	2	15	—	2	—	2	2	3	—	55	6	Bethnal Green.
—	—	1	—	—	—	—	—	—	—	—	—	—	—	5	—	Whitechapel.‖
—	—	—	—	1	—	2	—	1	—	—	—	—	—	6	—	St. George-in-the-East.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	2	Limehouse.
2	—	—	—	—	—	1	—	1	—	2	—	—	1	23	4	Mile End Old Town.
9	1	1	—	1	—	2	—	8	—	—	—	3	—	43	1	Poplar.
1	—	2	—	—	—	3	—	—	—	4	—	—	—	11	—	St. Saviour, Southwark.
2	—	1	—	—	—	—	—	2	—	—	—	6	—	16	2	St. George, Southwark.
—	1	—	1	—	—	—	—	—	—	1	—	—	—	13	3	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	1	Bermondsey.
2	—	1	—	—	—	—	—	—	—	—	—	—	—	14	1	Rotherhithe.
2	—	2	—	1	—	—	—	—	—	—	—	—	—	29	3	Lambeth.
1	—	4	—	—	—	1	—	—	—	1	—	2	—	54	7	Battersea.
—	—	3	—	1	—	—	—	—	—	1	—	—	—	13	—	Wandsworth.
2	—	1	—	—	—	2	—	1	—	1	—	2	—	26	1	Camberwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	1	Greenwich.
—	—	1	—	—	—	—	—	—	—	1	—	—	—	2	—	Lewisham.
1	—	2	—	—	—	—	—	—	—	—	—	—	—	7	2	Woolwich.
—	—	1	—	—	—	1	—	3	—	—	—	—	—	11	—	Plumstead.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Port of London.

‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96). ‖ Including Tower of London (population, 868).

Sanitary Areas.	Population (1891).	SMALL POX—*continued.* Weekly Statement, 4th Quarter, 1893.											
		Oct. 7.		Oct. 14.		Oct. 21.		Oct. 28.		Nov. 4.		Nov. 11.	
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
London	4,232,118	[a]19	1	17	2	13	—	31	2	31	1	61	1
(*Administrative County*)	-	[b]18	—	17	—	13	—	30	—	29	—	55	—
W. District. Kensington	166,308	1	—	—	—	1	—	6	1	13	—	21	—
W. District. Fulham	91,639	—	1	—	—	—	—	2	—	—	—	—	—
W. District. Hammersmith	97,239	—	—	—	—	—	—	—	—	—	—	—	—
W. District. Paddington	117,846	—	—	—	—	—	—	3	—	—	—	9	—
W. District. Chelsea	96,233	—	—	—	—	—	—	—	—	2	—	8	1
W. District. St. George, Hanover Sq.*	78,599	—	—	—	—	2	—	—	—	1	—	—	—
W. District. Westminster	55,539	1	—	—	—	—	—	—	—	—	—	—	—
W. District. St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—	—	—	—
N. District. St. Marylebone	142,404	—	—	1	—	1	—	—	—	—	—	1	—
N. District. Hampstead	68,416	—	—	—	—	—	—	—	—	—	—	—	—
N. District. St. Pancras	234,379	—	—	—	—	1	—	1	—	—	—	1	—
N. District. Islington	319,143	1	—	—	—	—	—	—	—	—	—	—	—
N. District. Hackney	229,542	1	—	—	—	1	—	—	—	—	—	—	—
Central District. St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—	—	—
Central District. St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—	—	—
Central District. Strand†	25,217	—	—	—	—	—	—	—	—	—	—	—	—
Central District. Holborn‡	34,043	1	—	—	—	1	—	—	—	—	—	—	—
Central District. Clerkenwell	66,216	—	—	—	—	—	—	—	—	—	—	—	—
Central District. St. Luke, Middlesex	42,440	—	—	—	—	—	—	1	—	—	—	—	—
Central District. London, City of§	37,583	—	—	—	—	—	—	—	—	—	—	1	—
E. District. Shoreditch	124,009	—	—	—	—	—	—	—	—	—	—	—	—
E. District. Bethnal Green	129,132	3	—	2	—	—	—	—	—	—	—	1	—
E. District. Whitechapel‖	74,420	—	—	1	—	—	—	—	—	—	—	—	—
E. District. St. George-in-the-East	45,795	1	—	—	—	—	—	—	—	1	—	—	—
E. District. Limehouse	57,376	—	—	1	—	1	—	3	—	3	—	—	1
E. District. Mile End Old Town	107,592	—	—	1	—	—	—	—	—	—	—	—	—
E. District. Poplar	166,748	1	—	5	1	2	—	10	—	6	1	12	—
S. District. St. Saviour, Southwark	27,177	2	—	—	—	—	—	—	—	—	—	—	—
S. District. St. George, Southwark	59,712	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Newington	115,804	—	—	—	—	—	—	—	—	—	—	—	—
S. District. St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Bermondsey	84,682	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Rotherhithe	39,255	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Lambeth	275,203	—	—	1	—	—	—	1	—	—	—	1	—
S. District. Battersea	150,558	1	—	1	1	1	—	1	—	2	—	1	—
S. District. Wandsworth	156,942	—	—	—	—	—	—	—	—	—	—	1	—
S. District. Camberwell	235,344	5	—	1	—	1	—	—	1	—	—	—	—
S. District. Greenwich	165,413	1	—	—	—	1	—	1	—	1	—	2	—
S. District. Lewisham	92,647	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Woolwich	40,848	—	—	3	—	—	—	1	—	2	—	1	—
S. District. Plumstead	88,539	—	—	—	—	—	—	1	—	—	—	—	—
S. District. Port of London	—	—	—	—	—	—	—	—	—	—	—	1	—

[a] Totals of actual *notifications.*
[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns as of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (populat

SMALL POX—*continued.*

Weekly Statement, 4th Quarter, 1893—*continued.*												Totals for 4th Quarter, 1893.		Grand Totals for Year 1893.		Sanitary Areas.
Nov. 25.		Dec. 2.		Dec. 9.		Dec. 16.		Dec. 23.		Dec. 30.						
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
18	3	32	—	26	3	27	2	22	1	19	—	338	18	2,948	186	London.
18	—	*32*	—	*20*	—	*24*	—	*21*	—	*15*	—	*313*	—	*2,813*	—	(*Administrative County.*)
5	1	9	—	8	2	1	1	3	—	1	—	77	5	106	10	Kensington.
—	—	1	—	—	—	—	—	—	—	—	—	5	1	33	2	Fulham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	18	3	Hammersmith.
2	—	5	—	2	—	5	—	3	—	1	—	30	—	73	4	Paddington.
1	—	1	—	—	—	2	—	—	—	2	—	14	1	45	1	Chelsea.
—	—	1	—	—	—	—	—	—	—	—	—	4	—	24	3	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	—	—	—	1	—	49	—	Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	56	1	St. James, Westminster.
2	—	1	—	—	—	1	—	—	—	—	—	7	—	186	5	St. Marylebone.
—	—	1	—	—	—	—	—	—	—	—	—	1	—	14	2	Hampstead.
2	—	1	—	1	—	4	1	1	1	—	—	12	2	127	9	St. Pancras.
—	—	—	—	1	—	5	—	2	—	3	—	12	—	131	2	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	67	4	Hackney.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	77	4	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	11	2	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	33	1	Strand.†
—	—	—	—	—	—	—	—	—	—	—	—	2	—	35	1	Holborn.‡
—	—	—	—	—	—	—	—	—	—	—	—	—	—	17	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	17	1	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	27	3	London, City of.§
1	—	—	—	—	—	1	—	—	—	—	—	2	—	33	3	Shoreditch.
—	—	—	—	—	—	—	—	—	—	—	—	6	—	89	7	Bethnal Green.
—	—	—	—	1	—	—	—	—	—	—	—	2	—	103	5	Whitechapel.‖
—	—	—	—	—	—	—	—	—	—	—	—	2	—	52	1	St. George-in-the-East.
1	—	1	—	—	—	—	—	—	—	—	—	13	1	84	8	Limehouse.
1	—	1	—	—	—	1	—	1	—	4	—	9	1	116	8	Mile End Old Town.
1	2	7	—	4	1	2	—	3	—	—	—	60	5	226	12	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	21	—	St. Saviour, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	85	7	St. George, Southwark.
—	—	—	—	3	—	—	—	—	—	2	—	5	—	77	6	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	1	St. Olave, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	56	4	Bermondsey.
—	—	—	—	—	—	—	—	—	—	1	—	1	—	92	13	Rotherhithe.
1	—	—	—	1	—	—	—	—	—	—	—	6	—	106	5	Lambeth.
—	—	—	—	—	—	1	—	—	—	—	—	8	1	124	12	Battersea.
1	—	—	—	—	—	—	—	—	—	—	—	3	—	34	1	Wandsworth.
—	—	—	—	—	—	—	—	—	—	—	—	7	1	142	11	Camberwell.
—	—	3	—	2	—	1	—	8	—	1	—	21	—	190	13	Greenwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	26	5	Lewisham.
—	—	—	—	1	—	1	—	—	—	3	—	12	—	63	4	Woolwich.
—	—	—	—	2	—	2	—	1	—	1	—	7	—	60	2	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	11	—	Port of London.

‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 126), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96).

‖ Including Tower of London (population, 865).

Sanitary Areas.		Population (1891).	Scarlet Fever. Weekly Statement, 1st Quarter, 1893.									
			Jan. 7.		Jan. 14.		Jan. 21.		Jan. 28.		Feb.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	
London		4,232,118	*428	32	394	35	451	25	445	35	449	
(*Administrative County*)			b412	—	*388*	—	*439*	—	*445*	—	*437*	
W. District.	Kensington	166,308	15	1	8	1	15	1	8	—	6	
	Fulham	91,639	10	—	18	—	9	—	5	1	7	
	Hammersmith	97,239	4	1	7	2	10	—	13	2	8	
	Paddington	117,846	14	—	5	1	9	—	15	2	9	
	Chelsea	96,253	7	1	1	—	10	2	6	—	13	
	St. George, Hanover Sq.*	78,599	5	1	4	2	2	—	4	1	12	
	Westminster	55,539	1	—	2	1	1	—	3	—	6	
	St. James, Westminster	24,995	—	—	—	—	1	—	2	—	2	
N. District.	St. Marylebone	142,404	12	—	10	1	15	—	7	—	12	
	Hampstead	68,416	7	—	6	—	6	—	11	1	7	
	St. Pancras	234,370	21	3	15	—	32	1	27	3	23	
	Islington	319,143	31	3	34	2	32	3	41	3	28	
	Hackney	229,542	20	1	24	—	39	3	31	3	34	
Central District.	St. Giles and St. George, Bloomsbury.	39,782	6	—	2	—	5	—	1	—	3	
	St. Martin-in-the-Fields	14,616	1	—	1	—	1	—	2	—	2	
	Strand†	25,217	—	—	1	—	—	—	2	—	2	
	Holborn‡	34,043	7	—	2	—	4	—	5	—	13	
	Clerkenwell	66,216	5	—	8	—	7	—	10	1	15	
	St. Luke, Middlesex	42,440	8	1	6	1	7	2	6	—	12	
	London, City of§	37,583	3	1	7	—	5	1	6	—	3	
E. District.	Shoreditch	124,009	7	—	18	—	12	1	6	—	11	
	Bethnal Green	129,132	12	1	16	2	11	—	14	—	11	
	Whitechapel‖	74,420	12	5	8	—	10	1	8	—	13	
	St. George-in-the-East	45,795	5	1	5	—	8	—	4	—	4	
	Limehouse	57,376	10	—	9	—	19	1	17	1	15	
	Mile End Old Town	107,392	17	—	11	1	18	—	14	2	14	
	Poplar	166,748	38	4	32	8	30	—	30	4	23	
S. District.	St. Saviour, Southwark	27,177	4	—	1	—	1	—	1	—	1	
	St. George, Southwark	59,712	2	—	7	1	1	—	2	1	5	
	Newington	115,804	5	1	10	1	16	—	13	1	6	
	St. Olave, Southwark	12,723	—	—	1	—	2	—	1	—	3	
	Bermondsey	84,682	9	1	7	2	7	—	12	—	3	
	Rotherhithe	39,255	1	—	2	—	3	—	—	—	—	
	Lambeth	275,203	21	2	18	1	18	3	21	1	24	
	Battersea	150,558	29	—	9	1	10	—	11	—	25	
	Wandsworth	156,942	8	2	15	2	12	1	12	2	9	
	Camberwell	235,344	28	1	30	1	21	—	35	3	14	
	Greenwich	165,413	14	1	21	2	26	2	21	2	20	
	Lewisham	92,647	5	—	3	—	6	2	3	—	16	
	Woolwich	40,848	6	—	2	1	2	—	6	—	5	
	Plumstead	88,539	18	—	8	1	8	1	9	1	5	
	Port of London	—	—	—	—	—	—	—	—	—	—	

* Totals of actual *notifications*.

b Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (popula

Sanitary Areas.		Population (1891).	Scarlet Fever—*continued.* Weekly Statement, 2nd Quarter, 1893.									
			April 8.		April 15.		April 22.		April 29.		May 6.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
London		4,232,118	[a]431	19	358	18	436	24	446	28	514	[illegible]
(*Administrative County*)			[b]421	—	348	—	424	—	434	—	494	—
W. District.	Kensington	166,308	9	—	8	—	9	—	13	—	21	—
	Fulham	91,639	13	1	13	2	21	1	8	—	1	[illegible]
	Hammersmith	97,239	8	—	8	1	9	1	7	2	15	—
	Paddington	117,846	7	—	14	1	10	1	8	1	16	—
	Chelsea	96,253	9	—	4	—	13	1	10	—	11	—
	St. George, Hanover Sq.*	78,599	4	—	7	—	18	1	6	—	5	—
	Westminster	55,539	3	—	2	—	3	1	2	1	4	—
	St. James, Westminster	24,995	1	—	—	—	—	—	2	—	1	—
N. District.	St. Marylebone	142,404	14	—	7	—	12	1	10	2	19	—
	Hampstead	68,416	8	1	9	—	17	1	14	1	10	—
	St. Pancras	234,379	20	2	25	1	29	—	23	3	24	—
	Islington	319,143	40	—	35	1	26	—	34	1	53	1
	Hackney	229,542	28	1	24	1	16	1	29	1	36	1
Central District.	St. Giles and St. George, Bloomsbury.	39,782	2	2	1	1	1	—	6	1	3	—
	St. Martin-in-the-Fields	14,616	4	—	2	—	1	—	—	—	2	—
	Strand†	25,217	2	—	1	—	2	1	1	1	3	—
	Holborn‡	34,043	3	—	1	—	4	1	9	—	3	—
	Clerkenwell	66,216	11	—	10	—	9	2	13	—	12	—
	St. Luke, Middlesex	42,440	2	—	3	—	4	1	3	—	3	1
	London, City of§	37,583	3	—	—	—	3	—	3	—	8	—
E. District.	Shoreditch	124,009	15	—	13	1	13	1	7	1	20	1
	Bethnal Green	129,132	7	1	6	1	12	2	10	1	20	1
	Whitechapel‖	74,420	12	—	3	—	4	—	14	—	15	—
	St. George-in-the-East	45,795	4	—	—	—	6	—	4	—	7	—
	Limehouse	57,376	11	2	6	—	8	1	7	1	9	—
	Mile End Old Town	107,592	21	1	18	—	19	1	18	1	12	1
	Poplar	166,748	26	1	24	3	25	—	33	4	26	3
S. District.	St. Saviour, Southwark	27,177	—	—	—	—	3	—	1	1	3	—
	St. George, Southwark	59,712	4	—	3	1	10	1	5	—	1	1
	Newington	115,804	12	2	14	1	13	—	12	1	12	—
	St. Olave, Southwark	12,723	3	—	3	—	2	—	4	1	—	—
	Bermondsey	84,682	8	—	5	1	5	—	6	—	11	2
	Rotherhithe	39,255	6	—	2	—	4	1	5	—	2	—
	Lambeth	275,203	19	2	24	—	29	—	30	2	17	1
	Battersea	150,558	32	2	17	1	17	—	32	1	27	—
	Wandsworth	156,942	13	—	9	—	14	2	15	2	29	2
	Camberwell	235,344	14	—	16	—	15	—	23	1	13	1
	Greenwich	165,413	16	1	9	—	14	1	10	—	10	—
	Lewisham	92,647	5	—	6	—	7	—	1	—	6	—
	Woolwich	40,848	1	—	1	—	1	—	3	—	7	1
	Plumstead	88,539	11	—	5	1	8	—	15	—	17	—
	Port of London	—	—	—	—	—	—	—	—	—	—	—

[a] Totals of actual *notifications.*
[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (popul

SCARLET FEVER—*continued.*

Weekly Statement, 2nd Quarter, 1893—*continued.*												Totals for 2nd Quarter, 1893.		Sanitary Areas.
May 27.		June 3.		June 10.		June 17.		June 24.		July 1.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
554	29	679	27	772	24	797	38	863	29	956	38	8,000	333	London,
539	—	*660*	—	*782*	—	*775*	—	*835*	—	*951*	—	*7,779*	—	*(Administrative County.)*
15	1	16	—	20	2	37	—	18	2	20	1	214	12	Kensington.
10	1	12	3	15	—	17	—	18	1	17	—	167	10	Fulham.
15	—	8	—	16	2	24	1	14	—	23	—	183	7	Hammersmith.
11	—	13	—	20	—	20	2	21	—	28	1	198	7	Paddington.
10	—	18	1	13	1	18	2	9	1	11	1	145	7	Chelsea.
14	1	9	2	15	3	13	1	10	1	15	1	138	11	St. George, Hanover Sq.*
6	—	16	—	9	—	8	1	8	—	13	—	95	5	Westminster.
1	—	5	—	5	—	5	—	2	—	4	—	35	1	St. James, Westminster.
13	2	20	—	17	1	26	2	33	1	31	1	238	11	St. Marylebone.
9	2	17	1	12	—	15	—	15	—	20	—	164	8	Hampstead.
41	2	46	3	52	2	53	1	70	2	57	1	507	19	St. Pancras.
48	2	63	2	72	—	58	1	81	4	82	4	672	20	Islington.
25	2	46	—	44	—	28	3	45	—	57	3	483	13	Hackney.
8	—	9	—	6	1	2	1	4	—	8	1‖	54	7	St. Giles and St. George, Bloomsbury.
—	—	10	—	3	—	4	—	3	—	5	—	37	—	St. Martin-in-the-Fields.
3	—	4	—	4	—	—	1	1	—	1	1	25	5	Strand.†
7	—	3	—	1	—	8	1	5	—	7	—	58	2	Holborn.‡
15	1	16	—	18	—	38	—	24	1	17	4	213	9	Clerkenwell.
5	—	5	—	14	1	8	—	4	—	14	—	71	4	St. Luke, Middlesex.
	1	6	—	13	—	4	—	2	1	23	—	87	2	London, City of.§
23	—	17	1	22	—	9	—	18	1	20	—	206	7	Shoreditch.
13	—	19	2	31	2	25	2	42	2	46	1	264	19	Bethnal Green.
2	—	11	—	12	1	21	2	19	—	11	—	161	3	Whitechapel.‖
7	—	9	—	8	—	7	—	11	—	10	—	86	—	St. George-in-the-East.
5	4	5	—	12	—	6	—	6	—	14	1	101	10	Limehouse.
17	—	27	2	30	1	20	—	29	2	30	2	283	13	Mile End Old Town.
51	1	31	2	25	2	40	3	41	1	22	2	406	22	Poplar.
4	—	2	—	7	1	12	1	14	—	10	1	65	5	St. Saviour, Southwark.
8	1	19	—	17	1	14	2	22	2	29	2	158	11	St. George, Southwark.
17	1	16	1	20	—	21	—	29	—	32	1	223	7	Newington.
2	—	4	—	2	—	3	—	1	—	2	1	27	2	St. Olave, Southwark.
9	2	13	1	14	—	16	—	20	3	12	1	141	11	Bermondsey.
3	1	4	1	5	—	4	—	9	—	10	—	61	3	Rotherhithe.
23	—	41	3	39	—	46	2	56	—	58	2	442	13	Lambeth.
20	—	24	—	34	2	26	—	31	1	31	—	347	7	Battersea.
16	—	22	—	28	—	47	1	37	—	49	—	327	8	Wandsworth.
29	2	25	—	43	—	32	3	25	1	41	—	335	9	Camberwell.
14	1	18	—	28	—	40	2	51	1	29	3	250	9	Greenwich.
5	—	5	—	11	—	10	—	10	—	25	1	101	1	Lewisham.
5	1	9	—	7	—	2	1	6	1	4	1	51	5	Woolwich.
17	—	16	2	8	1	10	2	19	—	18	—	181	8	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	Port of London.

ing Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple
n (population, 21), and Furnival's Inn (population, 121).
cluding Inner Temple (population, 96). ‖ Including Tower of London (population, 868).

	Sanitary Areas.	Population (1891).	SCARLET FEVER—*continued* Weekly Statement, 3rd Quarter, July 8. Cases.	July 8. Deaths.	July 15. Cases.	July 15. Deaths.	July 22. Cases.	July 22. Deaths.	July 29. Cases.	July 29. Deaths.	
	London	4,232,118	[a]968	35	993	34	1,026	36	1,003	36	1,
	(*Administrative County*)		[b]930	—	*962*	—	*991*	—	*988*	—	*1*
W. District.	Kensington	166,308	30	—	24	1	31	1	26	1	
W. District.	Fulham	91,639	14	1	12	—	17	1	16	1	
W. District.	Hammersmith	97,239	28	1	18	2	24	—	20	—	
W. District.	Paddington	117,846	31	—	38	2	30	1	24	1	
W. District.	Chelsea	96,253	11	—	10	—	16	1	20	3	
W. District.	St. George, Hanover Sq.*	78,599	21	1	17	—	28	—	19	—	
W. District.	Westminster	55,539	11	—	7	1	11	1	13	3	
W. District.	St. James, Westminster	24,995	2	—	5	—	—	—	2	—	
N. District.	St. Marylebone	142,404	23	—	26	1	38	4	29	3	
N. District.	Hampstead	68,416	7	—	20	—	14	—	9	—	
N. District.	St. Pancras	234,379	64	1	80	—	78	6	104	4	11
N. District.	Islington	319,143	88	—	69	2	68	—	68	2	10
N. District.	Hackney	229,542	44	4	70	2	63	1	75	2	5
Central District.	St. Giles and St. George, Bloomsbury.	39,782	5	—	4	—	9	1	2	—	4
Central District.	St. Martin-in-the-Fields	14,616	5	—	4	—	2	1	—	—	2
Central District.	Strand†	25,217	5	—	5	—	4	—	3	—	5
Central District.	Holborn‡	34,043	24	—	18	2	7	1	8	—	14
Central District.	Clerkenwell	66,216	26	4	34	2	16	1	18	1	14
Central District.	St. Luke, Middlesex	42,440	8	—	7	—	13	—	14	4	13
Central District.	London, City of§	37,583	4	—	3	—	7	—	2	—	5
E. District.	Shoreditch	124,009	20	1	31	2	30	1	19	1	17
E. District.	Bethnal Green	129,132	35	2	35	1	61	1	29	1	55
E. District.	Whitechapel‖	74,420	26	1	29	1	36	—	35	—	27
E. District.	St. George-in-the-East	45,795	11	1	6	—	16	1	9	—	8
E. District.	Limehouse	57,376	11	1	10	—	7	—	12	—	9
E. District.	Mile End Old Town	107,592	33	1	29	2	40	2	28	2	47
E. District.	Poplar	166,748	47	6	37	1	28	—	42	1	35
S. District.	St. Saviour, Southwark	27,177	3	—	8	—	3	—	3	1	6
S. District.	St. George, Southwark	59,712	25	3	18	—	12	4	28	—	23
S. District.	Newington	115,804	35	1	30	3	33	—	33	—	35
S. District.	St. Olave, Southwark	12,723	5	—	6	—	1	—	—	—	3
S. District.	Bermondsey	84,682	14	—	15	2	14	—	20	—	18
S. District.	Rotherhithe	39,255	6	—	2	—	4	1	12	—	9
S. District.	Lambeth	275,203	77	3	73	—	70	1	77	2	77
S. District.	Battersea	150,558	26	1	33	2	32	1	33	—	41
S. District.	Wandsworth	156,942	43	1	47	1	34	1	22	—	32
S. District.	Camberwell	235,344	35	—	48	3	46	1	43	1	50
S. District.	Greenwich	165,413	30	—	21	1	39	1	40	—	25
S. District.	Lewisham	92,647	16	—	23	—	16	—	14	—	21
S. District.	Woolwich	40,848	4	—	5	—	7	—	12	—	14
S. District.	Plumstead	88,539	15	1	16	—	21	1	20	2	19
S. District.	Port of London	—	—	—	—	—	—	—	—	—	—

[a] Totals of actual *notifications*.
[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of return of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (popul

	Sanitary Areas.	Population (1891).	SCARLET FEVER—continued. Weekly Statement, 4th Quarter. Oct. 7. Cases.	Oct. 7. Deaths.	Oct. 14. Cases.	Oct. 14. Deaths.	Oct. 21. Cases.	Oct. 21. Deaths.	Oct. 28. Cases.	Oct. 28. Deaths.	Nov. 4. Cases.	Nov. 4. Deaths.
	London	4,232,118	[a]1,213	39	1,287	34	1,262	39	1,164	33	1,107	43
	(*Administrative County*)	-	[b]*1,186*	—	*1,251*	—	*1,223*	—	*1,145*	—	*1,073*	—
W. District.	Kensington	166,308	32	1	34	—	27	1	38	2	26	1
	Fulham	91,639	19	—	24	1	14	1	21	1	23	—
	Hammersmith	97,239	28	2	25	—	8	1	21	—	18	1
	Paddington	117,846	25	2	21	2	28	1	17	—	22	3
	Chelsea	96,253	17	—	12	2	21	—	14	—	12	—
	St. George, Hanover Sq.*	78,599	20	1	27	—	21	—	27	—	24	—
	Westminster	55,539	14	—	14	1	13	2	7	—	14	1
	St. James, Westminster	24,995	4	—	1	—	9	—	2	—	—	—
N. District.	St. Marylebone	142,404	27	2	39	1	22	3	22	2	28	1
	Hampstead	68,416	15	—	15	1	16	1	15	1	19	—
	St. Pancras	234,379	62	1	71	2	77	1	88	1	61	1
	Islington	319,143	92	5	96	—	105	2	71	—	88	5
	Hackney	229,542	82	2	75	2	86	1	89	—	69	—
Central District.	St. Giles and St. George, Bloomsbury.	30,782	11	—	14	1	10	—	6	—	9	1
	St. Martin-in-the-Fields	14,616	3	—	4	—	2	—	3	—	4	—
	Strand†	25,217	3	—	7	—	4	—	1	—	4	1
	Holborn‡	34,043	17	—	13	—	5	—	5	—	5	—
	Clerkenwell	66,216	28	1	29	2	20	1	22	—	21	2
	St. Luke, Middlesex	42,440	7	—	17	—	10	—	12	—	12	—
	London, City of§	37,583	5	—	23	—	18	—	9	—	5	—
E. District.	Shoreditch	124,009	31	1	39	2	31	—	48	2	28	1
	Bethnal Green	129,132	42	2	56	—	58	1	52	6	51	2
	Whitechapel‖	74,420	16	1	25	—	21	1	26	—	27	—
	St. George-in-the-East	45,795	27	—	30	1	19	—	11	3	16	—
	Limehouse	57,376	29	—	30	1	24	1	26	—	23	1
	Mile End Old Town	107,592	31	—	25	2	37	2	41	—	23	3
	Poplar	166,748	67	2	59	1	53	2	47	1	44	3
S. District.	St. Saviour, Southwark	27,177	6	—	11	—	7	—	1	—	5	1
	St. George, Southwark	59,712	20	—	16	—	22	—	25	1	17	1
	Newington	115,804	52	2	58	2	48	3	35	—	45	1
	St. Olave, Southwark	12,723	3	—	11	—	6	1	2	—	3	—
	Bermondsey	84,682	19	1	17	—	12	—	16	—	15	—
	Rotherhithe	39,255	7	1	10	—	14	—	11	—	22	1
	Lambeth	275,203	74	1	89	1	87	4	79	4	90	3
	Battersea	150,558	60	1	39	1	52	1	38	—	35	1
	Wandsworth	156,942	38	4	46	4	57	1	33	2	46	—
	Camberwell	235,344	60	2	73	1	87	2	68	2	59	2
	Greenwich	165,413	45	3	54	1	64	2	67	5	56	4
	Lewisham	92,647	37	—	17	1	23	—	22	—	19	1
	Woolwich	40,848	6	—	8	—	13	1	10	—	5	1
	Plumstead	88,539	32	1	13	1	11	2	16	—	14	—
	Port of London	—	—	—	—	—	—	—	—	—	—	—

[a] Totals of actual *notifications*.
[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (p

Sanitary Areas.	Population (1891).	Diphtheria. Weekly Statement, 1st Quarter, 1893. Jan. 7. Cases.	Jan. 7. Deaths.	Jan. 14. Cases.	Jan. 14. Deaths.	Jan. 21. Cases.	Jan. 21. Deaths.	Jan. 28. Cases.	Jan. 28. Deaths.	Feb. Cases.
London	4,232,118	*174	46	131	57	127	37	178	50	175
(*Administrative County*)	-	b161	—	*128	—	*122	—	*172	—	*69
W. District. Kensington	166,308	2	1	3	—	1	1	2	3	3
W. District. Fulham	91,639	2	—	3	—	—	1	2	1	—
W. District. Hammersmith	97,239	3	1	1	—	—	—	5	—	15
W. District. Paddington	117,846	2	3	3	—	5	—	4	2	7
W. District. Chelsea	96,253	2	—	2	—	5	1	1	1	6
W. District. St. George, Hanover Sq.*	78,599	2	—	3	2	2	—	—	—	1
W. District. Westminster	55,539	1	1	2	—	1	—	2	—	1
W. District. St. James, Westminster	24,795	—	—	—	—	—	—	—	—	1
N. District. St. Marylebone	142,404	3	1	—	2	—	1	4	1	5
N. District. Hampstead	68,416	—	—	1	—	1	—	3	1	2
N. District. St. Pancras	234,379	10	1	15	7	4	4	17	2	10
N. District. Islington	319,143	13	2	11	4	13	3	10	4	8
N. District. Hackney	229,542	14	3	5	4	10	2	17	7	16
Central District. St. Giles and St. George, Bloomsbury.	39,782	7	3	2	1	—	—	—	—	—
Central District. St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—
Central District. Strand†	25,217	2	1	1	—	4	—	1	—	2
Central District. Holborn‡	34,043	1	—	1	—	—	—	2	1	1
Central District. Clerkenwell	66,216	3	2	—	—	5	1	5	2	—
Central District. St. Luke, Middlesex	42,440	1	—	—	—	—	1	1	—	1
Central District. London, City of§	37,583	2	—	—	—	—	—	—	—	6
E. District. Shoreditch	124,009	2	1	2	—	4	1	10	3	3
E. District. Bethnal Green	129,132	9	1	14	6	10	4	13	1	6
E. District. Whitechapel‖	74,420	4	2	2	1	3	—	3	2	4
E. District. St. George-in-the-East	45,795	3	1	3	1	7	2	2	1	8
E. District. Limehouse	57,376	3	1	1	3	2	—	4	1	5
E. District. Mile End Old Town	107,592	4	—	1	1	2	1	9	2	3
E. District. Poplar	166,748	8	—	6	2	3	—	8	1	6
S. District. St. Saviour, Southwark	27,177	2	—	—	—	1	—	1	—	—
S. District. St. George, Southwark	59,712	—	—	2	2	—	—	2	—	1
S. District. Newington	115,804	1	—	3	—	3	1	4	—	8
S. District. St. Olive, Southwark	12,723	—	—	—	—	—	—	—	—	—
S. District. Bermondsey	84,682	1	—	2	2	3	1	2	2	6
S. District. Rotherhithe	39,255	—	—	1	1	—	—	3	1	1
S. District. Lambeth	275,203	18	3	9	4	13	7	7	2	5
S. District. Battersea	150,558	14	6	6	4	7	2	7	1	9
S. District. Wandsworth	156,942	8	—	6	1	6	—	4	1	6
S. District. Camberwell	235,344	2	2	4	—	3	—	10	2	5
S. District. Greenwich	165,413	5	4	5	2	2	—	4	—	8
S. District. Lewisham	92,647	11	2	5	3	1	—	1	—	1
S. District. Woolwich	40,848	1	—	—	1	—	—	1	—	—
S. District. Plumstead	88,539	9	4	6	3	6	3	7	5	3
S. District. Port of London	—	—	—	—	—	—	—	—	—	—

* Totals of actual *notifications*.

b Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (popul

DIPHTHERIA—*continued.*

Weekly Statement, 1st Quarter, 1893—*continued.*													Totals for 1st Quarter, 1893.		Sanitary Areas.
eb. 18.		Feb. 25.		March 4.		March 11.		March 18.		March 25.		April 1.			
	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
	60	182	49	139	36	175	38	164	65	172	49	134	34	2,094	623	London.
	—	*176*	—	*135*	—	*164*	—	*160*	—	*168*	—	*126*	—	*2,008*	—	(*Administrative County.*)
	—	6	—	3	2	8	2	2	3	3	1	4	—	45	15	Kensington.
	2	—	—	2	—	2	—	4	1	2	—	1	1	21	7	Fulham.
	1	5	1	3	1	5	2	1	—	1	—	2	—	46	8	Hammersmith.
	4	3	1	2	—	5	1	3	—	7	1	1	2	51	15	Paddington.
	2	4	1	—	—	8	1	3	1	1	1	2	—	45	11	Chelsea.
	1	—	2	1	—	—	—	1	1	1	—	1	—	17	8	St. George, Hanover Sq.*
	—	1	—	1	—	—	—	—	—	1	—	4	—	19	1	Westminster.
	1	1	—	—	—	3	1	—	—	—	—	—	—	6	2	St. James, Westminster.
	1	3	—	3	3	5	—	7	3	4	1	4	—	44	13	St. Marylebone.
	—	3	1	3	1	3	2	4	—	7	3	5	3	40	16	Hampstead.
	6	16	7	7	5	13	1	16	3	17	1	11	4	161	51	St. Pancras.
	5	9	2	7	1	14	3	10	5	10	—	9	1	144	32	Islington.
	5	10	3	13	4	6	1	13	4	13	4	4	—	147	46	Hackney.
	—	2	—	1	1	1	—	—	—	—	—	1	—	15	5	St. Giles and St. George, Bloomsbury.
	—	—	—	—	—	4	—	—	1	1	1	—	—	6	2	St. Martin-in-the-Fields.
	—	—	—	—	—	—	—	—	—	—	—	—	1	11	3	Strand.†
	—	—	—	—	—	1	1	1	—	—	1	1	—	10	3	Holborn.‡
	1	—	—	4	—	7	—	4	4	6	—	4	—	43	10	Clerkenwell.
	2	3	—	2	1	1	—	3	1	2	—	1	—	16	6	St. Lukes, Middlesex.
	—	1	—	2	—	—	—	—	—	1	—	—	1	14	1	London, City of.§
	—	7	3	4	1	5	1	5	4	5	3	3	1	62	22	Shoreditch.
	3	9	1	10	2	10	4	6	2	5	1	13	5	120	34	Bethnal Green.
	1	5	2	1	—	—	—	3	1	1	2	2	1	36	12	Whitechapel.‖
	4	1	2	4	1	3	3	4	1	1	1	3	2	51	25	St. George-in-the-East.
	—	1	—	5	1	3	1	—	1	3	—	3	1	37	12	Limehouse.
	3	9	1	10	—	4	—	7	3	8	3	6	1	74	20	Mile End Old Town.
	2	32	6	15	8	13	1	13	3	16	7	17	—	158	32	Poplar.
	2	—	—	1	—	1	1	2	1	3	1	1	—	16	5	St. Saviour, Southwark.
	1	—	1	2	1	4	1	—	—	1	—	2	1	21	7	St. George, Southwark.
	4	4	3	3	—	3	—	10	2	9	2	5	—	68	16	Newington.
	—	1	—	—	—	—	—	1	—	—	—	2	—	4	—	St. Olave, Southwark.
	1	1	—	1	1	2	1	3	3	2	2	1	—	26	18	Bermondsey.
	—	1	1	1	—	1	1	—	—	1	—	—	—	9	6	Rotherhithe.
	2	17	6	7	1	13	2	7	5	7	4	4	1	131	46	Lambeth.
	—	8	—	4	—	1	1	13	3	10	3	4	1	94	26	Battersea.
	—	3	—	2	—	4	1	2	—	3	1	2	2	57	9	Wandsworth.
	2	6	—	6	—	3	2	5	1	4	1	3	2	60	14	Camberwell.
	2	6	1	4	1	8	1	1	4	5	1	2	1	56	21	Greenwich.
	—	1	1	2	—	6	1	5	2	4	—	3	—	47	11	Lewisham.
	—	—	—	1	—	—	—	2	1	—	1	—	—	5	3	Woolwich.
	2	3	3	2	—	5	1	3	1	7	2	3	2	61	29	Plumstead.
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Port of London.

ing Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 126), Staple (population, 24), and Furnival's Inn (population, 121).
ner Temple (population, 96).

‖ Including Tower of London (population, 868.)

Sanitary Areas.	Population (1891).	Diphtheria—*continued.* Weekly Statement, 2nd Quarter, 1893.								
		April 8.		April 15.		April 22.		April 29.		May
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.
London	4,232,118	*173	38	144	44	165	42	192	48	229
(*Administrative County*)		*169	—	136	—	162	—	183	—	221
W. District. Kensington	166,308	2	—	2	—	1	—	8	1	2
W. District. Fulham	91,639	1	—	2	—	—	1	2	—	3
W. District. Hammersmith	97,239	3	—	2	—	1	—	2	1	5
W. District. Paddington	117,846	6	1	7	1	7	1	8	4	5
W. District. Chelsea	96,253	4	—	4	1	1	1	3	1	2
W. District. St. George, Hanover Sq.*	78,599	2	1	1	—	1	—	2	—	—
W. District. Westminster	55,539	—	—	—	—	—	—	—	1	3
W. District. St. James, Westminster	24,995	—	—	—	1	—	—	7	—	1
N. District. St. Marylebone	142,404	5	3	7	—	5	3	8	6	16
N. District. Hampstead	68,416	2	—	1	—	2	1	5	—	9
N. District. St. Pancras	234,379	17	7	7	2	11	2	5	2	14
N. District. Islington	319,143	14	4	16	1	11	6	12	5	14
N. District. Hackney	229,542	9	2	8	2	12	1	10	2	11
Central District. St. Giles and St. George, Bloomsbury.	39,782	—	—	2	—	1	1	2	—	2
Central District. St. Martin-in-the-Fields	14,616	—	—	1	—	—	—	1	—	1
Central District. Strand†	25,217	1	1	1	1	2	—	3	1	3
Central District. Holborn‡	34,043	5	—	—	2	—	—	—	—	—
Central District. Clerkenwell	66,216	4	1	3	4	3	—	10	2	7
Central District. St. Luke, Middlesex	42,440	1	—	1	—	1	—	1	—	2
Central District. London, City of§	37,583	2	—	1	—	3	—	2	—	—
E. District. Shoreditch	124,009	5	3	7	3	8	—	11	5	9
E. District. Bethnal Green	129,132	10	2	10	—	10	—	12	2	6
E. District. Whitechapel‖	74,420	2	—	3	1	2	1	4	—	4
E. District. St. George-in-the-East	45,795	4	1	4	2	4	2	2	1	7
E. District. Limehouse	57,376	1	1	—	—	5	2	4	—	5
E. District. Mile End Old Town	107,592	7	1	8	—	4	2	1	1	2
E. District. Poplar	166,748	16	—	8	5	8	2	28	1	22
S. District. St. Saviour, Southwark	27,177	1	—	—	—	—	—	2	—	3
S. District. St. George, Southwark	59,712	1	—	—	1	4	—	5	1	3
S. District. Newington	115,804	7	—	1	1	8	5	5	—	5
S. District. St. Olave, Southwark	12,723	—	—	—	1	—	—	—	—	—
S. District. Bermondsey	84,682	—	1	1	1	3	2	1	—	1
S. District. Rotherhithe	39,255	2	—	3	1	—	—	—	—	5
S. District. Lambeth	275,203	8	1	7	1	9	2	9	2	17
S. District. Battersea	150,558	6	2	5	1	11	1	5	4	15
S. District. Wandsworth	156,942	4	2	2	1	1	—	4	—	8
S. District. Camberwell	235,344	5	1	3	1	4	2	2	—	9
S. District. Greenwich	165,413	6	1	5	4	8	1	3	3	4
S. District. Lewisham	92,647	1	—	6	3	4	—	1	1	4
S. District. Woolwich	40,848	2	—	—	—	—	—	1	—	—
S. District. Plumstead	88,539	7	2	5	2	10	4	1	1	—
S. District. Port of London	—	—	—	—	—	—	—	—	—	—

* Totals of actual *notifications*.

† Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns of duplicate notifications.

‡ Including St. Peters, Westminster (population, 235). † Including Middle Temple (popula

DIPHTHERIA—*continued.*

Weekly Statement, 2nd Quarter, 1893—*continued.*													Totals for 2nd Quarter, 1893.		Sanitary Areas.
May 27.		June 3.		June 10.		June 17.		June 24.		July 1.					
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.		Cases.	Deaths.	
217	41	191	51	257	39	306	61	313	67	300	63		2,934	660	London.
206	—	*184*	—	*251*	—	*294*	—	*305*	—	*293*	—		*2,843*	—	(*Administrative County.*)
5	—	12	2	7	2	2	2	7	—	10	4		75	14	Kensington.
1	—	8	3	2	4	5	—	2	—	5	3		35	14	Fulham.
8	1	5	—	3	—	4	1	15	—	20	1		76	6	Hammersmith.
6	1	6	2	5	—	3	1	5	—	4	1		68	15	Paddington.
3	1	—	—	2	—	5	1	2	1	6	1		40	8	Chelsea.
1	—	1	2	2	1	7	—	2	4	7	1		29	10	St. George, Hanover Sq.*
1	—	—	—	2	—	1	—	—	—	—	—		13	5	Westminster.
1	—	—	1	1	—	—	—	2	—	4	—		19	3	St. James, Westminster.
8	1	11	1	12	—	10	2	11	1	7	2		123	32	St. Marylebone.
11	2	5	3	—	1	6	1	1	—	2	1		55	13	Hampstead.
12	2	5	3	16	2	27	6	21	2	5	5		165	42	St. Pancras.
10	3	17	6	21	2	9	—	27	3	22	7		201	45	Islington.
16	1	13	4	16	5	16	1	12	—	13	3		180	35	Hackney.
1	—	—	—	—	—	2	—	1	—	4	1		19	5	St. Giles and St. George, Bloomsbury.
1	—	—	—	2	—	—	—	—	—	—	—		7	1	St. Martin-in-the-Fields.
5	2	1	—	5	—	3	1	1	—	1	1		30	7	Strand.†
4	3	5	2	6	—	1	1	1	—	6	1		31	9	Holborn.‡
5	1	2	1	10	1	11	2	3	2	4	—		84	26	Clerkenwell.
4	—	3	2	2	1	4	—	3	1	2	1		28	7	St. Luke, Middlesex.
1	—	—	—	1	—	4	—	3	1	2	—		24	2	London, City of.§
12	3	5	2	6	3	17	5	8	3	13	1		118	33	Shoreditch.
14	1	11	2	15	—	17	4	15	3	24	2		168	19	Bethnal Green.
2	3	1	1	5	—	5	3	3	1	5	—		44	13	Whitechapel.‖
9	2	8	2	7	—	8	5	9	1	4	—		73	18	St. George-in-the-East.
4	2	2	—	5	1	4	—	6	3	—	—		43	14	Limehouse.
5	1	12	2	6	2	12	4	9	6	9	2		86	26	Mile End Old Town.
8	—	9	—	18	—	48	6	48	9	29	7		283	43	Poplar.
2	—	—	—	3	—	3	—	2	—	1	—		17	1	St. Saviour, Southwark.
3	—	—	—	1	—	5	—	7	—	4	—		34	4	St. George, Southwark.
7	1	5	—	12	2	6	1	9	1	13	2		83	16	Newington.
—	—	2	1	—	—	1	—	1	—	—	—		4	2	St. Olave, Southwark.
3	1	3	3	8	4	2	1	5	3	12	2		53	21	Bermondsey.
4	—	2	—	2	—	2	—	2	1	4	—		31	4	Rotherhithe.
13	3	13	—	12	2	14	—	16	3	18	2		167	28	Lambeth.
8	4	10	4	14	1	11	2	23	7	11	2		135	35	Battersea.
6	—	2	—	5	1	7	2	6	3	9	4		59	16	Wandsworth.
5	1	4	1	13	3	7	2	9	4	9	1		81	17	Camberwell.
2	1	6	1	9	—	9	4	7	—	6	3		71	22	Greenwich.
3	—	2	—	—	—	6	2	3	2	2	—		37	12	Lewisham.
1	—	—	—	—	—	—	—	1	—	—	1		5	2	Woolwich.
2	—	—	—	1	1	2	1	5	2	3	1		40	15	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Port of London.

ding Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 126), Staple n (population, 21), and Furnival's Inn (population, 121).
ncluding Inner Temple (population, 96). ‖ Including Tower of London (population, 898).

	Sanitary Areas.	Population (1891).	Diphtheria—*continued.* Weekly Statement, 3rd Quarter, 1893. July 8. Cases.	July 8. Deaths.	July 15. Cases.	July 15. Deaths.	July 22. Cases.	July 22. Deaths.	July 29. Cases.	July 29. Deaths.	Aug. 5. Cases.	Aug. 5. Deaths.	Aug. Cases.
	London	4,232,118	*282	34	306	38	282	65	292	71	321	64	32
	(Administrative County)		†276	—	296	—	272	—	284	—	306	—	30
W. District.	Kensington	166,208	3	1	17	3	17	2	14	3	10	2	1
	Fulham	91,639	3	1	2	2	1	—	5	2	4	1	1
	Hammersmith	97,239	6	—	19	3	8	4	5	—	7	2	1
	Paddington	117,846	6	1	10	—	4	3	9	1	6	—	1
	Chelsea	96,253	6	1	4	—	4	1	8	4	5	1	1
	St. George, Hanover Sq.*	78,509	3	—	3	—	3	—	5	3	7	3	1
	Westminster	55,539	6	2	3	—	4	1	1	—	—	—	1
	St. James, Westminster	24,995	1	1	—	1	1	—	1	1	1	—	1
N. District.	St. Marylebone	142,404	10	—	5	1	8	—	3	1	6	—	4
	Hampstead	68,416	—	—	1	1	1	—	2	1	3	1	1
	St. Pancras	234,379	20	8	15	2	21	5	21	3	17	4	2
	Islington	319,143	17	2	17	2	12	3	12	6	16	3	2
	Hackney	229,342	8	—	12	2	9	2	16	4	20	4	3
Central District.	St. Giles and St. George, Bloomsbury.	39,782	3	—	4	—	1	2	1	—	—	1	1
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	1	1	—	—	—
	Strand†	23,217	—	—	4	1	1	—	1	2	4	—	1
	Holborn‡	34,043	1	—	2	1	3	—	2	2	1	—	—
	Clerkenwell	66,216	11	—	7	2	9	1	3	2	4	—	1
	St. Luke, Middlesex	42,440	6	—	1	2	4	3	3	—	7	—	4
	London, City of§	37,583	—	1	—	—	2	2	4	—	2	1	—
E. District.	Shoreditch	124,009	14	2	9	6	12	5	16	5	13	5	10
	Bethnal Green	129,132	20	2	15	2	18	5	20	3	22	4	12
	Whitechapel	74,420	6	—	9	—	6	1	5	2	5	2	1
	St. George-in-the-East	45,795	7	2	9	—	4	—	2	1	5	—	4
	Limehouse	57,376	7	2	3	—	2	1	7	1	5	1	1
	Mile End Old Town	107,592	6	1	14	1	3	2	16	2	4	2	4
	Poplar	166,748	21	4	33	6	30	2	23	2	19	3	12
S. District.	St. Saviour, Southwark	27,177	3	—	1	—	2	—	1	—	4	2	1
	St. George, Southwark	59,712	2	1	—	1	4	1	3	—	7	—	1
	Newington	115,804	9	5	5	2	13	1	14	—	6	—	10
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—	—
	Bermondsey	84,682	5	3	5	—	5	1	4	—	2	—	1
	Rotherhithe	39,255	6	3	2	—	2	1	4	1	2	—	1
	Lambeth	275,203	20	3	23	2	15	2	9	4	26	3	12
	Battersea	150,558	12	2	21	2	9	—	16	4	19	3	6
	Wandsworth	156,942	5	—	10	1	12	6	12	4	10	4	11
	Camberwell	235,344	13	4	7	2	15	3	6	1	8	2	6
	Greenwich	165,413	7	1	10	1	12	4	13	4	19	2	7
	Lewisham	92,647	5	—	1	—	1	—	1	—	5	2	—
	Woolwich	40,848	—	—	—	—	1	—	—	—	—	—	—
	Plumstead	88,539	4	1	2	1	3	1	9	1	5	1	4
	Port of London	—	—	—	—	—	—	—	—	—	—	—	—

* Totals of actual *notifications*.
† Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and de
duplicate notifications.
‡ Including St. Peters, Westminster (population, 235). † Including Middle Temple (population,

DIPHTHERIA—*continued.*

Weekly Statement, 3rd Quarter, 1893—*continued.*													Totals for 3rd Quarter, 1893.		Sanitary Areas.
..t. 19.		Aug. 26.		Sept. 2.		Sept. 9.		Sept. 16.		Sept. 23.		Sept. 30.			
Deaths.		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
63		269	55	271	54	322	64	351	64	448	86	411	94	4,070	848	London.
—		*259*	—	*257*	—	*312*	—	*339*	—	*436*	—	*396*	—	*3,917*	—	(*Administrative County.*)
1		7	1	7	1	5	1	13	3	8	2	3	1	117	26	Kensington.
1		—	2	5	3	4	1	9	—	8	1	16	1	61	15	Fulham.
3		12	3	6	1	4	1	—	1	9	2	9	3	87	24	Hammersmith.
—		3	—	3	1	5	2	7	1	6	4	3	1	67	14	Paddington.
—		5	—	7	—	3	2	2	1	5	—	2	—	58	11	Chelsea.
—		—	—	6	—	4	—	2	—	4	1	2	—	44	8	St. George, Hanover Sq.*
—		1	—	1	—	2	—	3	—	—	—	—	—	23	3	Westminster.
1		1	—	2	2	—	—	2	—	—	—	—	—	11	6	St. James, Westminster.
2		6	1	5	1	7	1	12	2	15	3	13	4	105	17	St. Marylebone.
—		3	1	3	—	2	—	—	—	3	—	4	—	34	4	Hampstead.
4		19	3	7	4	24	4	16	1	22	3	18	6	241	53	St. Pancras.
6		25	5	13	2	19	9	31	5	19	3	26	4	249	53	Islington.
1		21	4	18	1	26	4	30	5	32	8	35	3	253	44	Hackney.
1		--	—	4	—	—	--	1	—	3	—	—	1	21	5	St. Giles and St. Georg. Bloomsbury.
—		—	—	1	—	—	—	—	—	2	1	—	—	4	2	St. Martin-in-the-Fields.
1		1	—	1	—	—	—	—	—	1	—	3	—	19	5	Strand.†
—		—	—	2	—	4	1	5	—	3	1	5	1	28	6	Holborn.‡
1		13	2	3	—	5	3	9	1	3	2	14	4	93	18	Clerkenwell.
2		5	—	2	1	7	3	11	1	8	1	4	1	70	16	St. Luke, Middlesex.
—		—	—	3	—	2	—	—	—	—	—	—	1	13	5	London, City of.§
2		7	--	9	2	16	2	20	2	18	3	16	3	182	40	Shoreditch.
2		12	--	7	1	25	4	21	6	31	4	16	2	244	39	Bethnal Green.
2		10	1	9	2	2	3	9	2	5	3	8	3	80	22	Whitechapel.‖
2		1	—	4	1	3	—	3	—	12	—	12	—	75	8	St. George-in-the-East.
3		11	4	15	3	6	2	5	1	13	—	6	—	98	21	Limehouse.
1		6	1	7	1	7	—	4	—	20	3	6	1	103	15	Mile End Old Town.
4		17	4	29	4	47	3	35	5	57	7	40	8	390	57	Poplar.
—		—	—	4	1	—	—	2	1	2	—	3	3	28	7	St. Saviour, Southwark.
2		6	1	11	--	9	—	2	3	7	4	7	2	79	16	St. George, Southwark.
3		12	5	10	3	16	3	11	3	18	1	14	2	166	29	Newington.
--		—	1	2	—	—	—	—	—	—	—	2	—	4	1	St. Olave, Southwark.
—		7	—	5	4	2	1	3	--	4	1	7	3	54	14	Bermondsey.
2		2	1	3	—	1	—	2	—	1	2	2	—	36	11	Rotherhithe.
—		22	2	8	—	19	6	28	3	30	6	19	5	250	44	Lambeth.
1		4	2	9	3	15	2	16	5	20	8	29	11	182	45	Battersea.
4		16	5	8	7	12	1	15	5	20	6	14	1	151	47	Wandsworth.
4		6	4	6	—	3	2	9	1	8	2	17	2	109	28	Camberwell.
2		1	2	7	2	8	1	7	5	19	3	29	15	145	45	Greenwich.
2		4	—	4	3	3	1	1	1	5	1	3	--	40	12	Lewisham.
--		—	--	1	—	1	--	1	—	1	—	—	—	6	—	Woolwich.
3		3	—	—	—	2	1	4	—	6	—	4	2	50	12	Plumstead.
—		—	—	—	--	—	—	—	--	—	—	—	—	—	—	Port of London.

‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 130), Staple Inn (population, 21), and Furnival's Inn (population, 121).
§ Including Inner Temple (population, 96). ‖ Including Tower of London (population,)

Sanitary Areas.	Population (1891).	Diphtheria—*continued.* Weekly Statement, 4th Quarter, 1892.											
		Oct. 7.		Oct. 14.		Oct. 21.		Oct. 28.		Nov. 4.		No	
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	
London	4,232,118	[a]436	72	380	84	400	82	330	81	282	87	314	
(*Administrative County*)	-	[b]426	—	389	—	392	—	356	—	269	—	307	
W. District. Kensington	166,208	3	—	24	2	12	5	9	2	15	3	9	
W. District. Fulham	91,639	18	1	16	1	10	2	7	1	7	2	7	
W. District. Hammersmith	97,239	15	2	1	1	9	—	8	1	2	1	3	
W. District. Paddington	117,846	11	3	8	2	12	1	11	5	5	2	8	
W. District. Chelsea	96,253	13	1	3	1	8	3	7	5	3	—	3	
W. District. St. George, Hanover Sq.*	78,592	1	—	2	1	2	—	2	—	1	1	2	
W. District. Westminster	53,339	2	—	3	1	2	1	—	—	5	—	6	
W. District. St. James, Westminster	24,905	1	—	1	—	1	—	2	1	2	—	1	
N. District. St. Marylebone	142,404	12	4	17	4	4	1	4	1	11	3	11	
N. District. Hampstead	68,416	5	2	5	—	1	1	5	—	5	—	—	
N. District. St. Pancras	234,379	25	3	18	5	25	7	15	7	28	7	8	
N. District. Islington	319,143	24	4	24	3	25	5	24	4	18	3	22	
N. District. Hackney	229,542	38	4	32	5	41	10	32	5	27	5	30	
Central District. St. Giles and St. George, Bloomsbury.	39,782	1	1	10	1	3	—	1	—	6	1	3	
Central District. St. Martin-in-the-Fields	14,616	—	—	1	—	—	—	1	—	1	1	1	
Central District. Strand†	23,217	1	1	—	—	—	—	3	2	4	—	2	
Central District. Holborn‡	34,043	3	—	2	1	4	—	4	—	2	—	4	
Central District. Clerkenwell	64,216	18	3	11	4	3	2	3	—	11	1	7	
Central District. St. Luke, Middlesex	42,440	5	1	5	—	5	3	6	2	3	2	—	
Central District. London, City of§	37,583	1	—	1	—	2	—	6	1	1	2	—	
E. District. Shoreditch	124,009	17	4	21	1	21	2	9	6	4	5	8	
E. District. Bethnal Green	129,132	22	7	23	3	11	—	14	3	22	3	15	
E. District. Whitechapel‖	74,420	3	—	8	2	3	—	3	1	3	—	5	
E. District. St. George-in-the-East	45,795	9	1	1	1	7	1	5	2	9	—	3	
E. District. Limehouse	57,376	10	3	2	1	10	1	5	1	3	1	2	
E. District. Mile End Old Town	107,592	5	1	8	1	5	—	5	1	6	1	5	
E. District. Poplar	166,748	39	2	27	5	17	2	34	1	22	3	21	
S. District. St. Saviour, Southwark	27,177	4	—	2	1	1	—	4	—	3	—	—	
S. District. St. George, Southwark	59,712	4	—	1	3	8	3	2	2	7	—	3	
S. District. Newington	115,804	19	1	16	5	13	1	17	2	16	3	9	
S. District. St. Olave, Southwark	12,723	1	—	1	—	1	—	—	—	2	1	3	
S. District. Bermondsey	84,682	7	—	4	1	7	3	11	2	9	2	5	
S. District. Rotherhithe	39,255	4	1	—	2	—	—	4	1	5	—	—	
S. District. Lambeth	275,203	20	1	26	4	31	6	15	3	25	10	20	
S. District. Battersea	150,558	17	2	14	5	21	8	20	5	36	7	15	
S. District. Wandsworth	156,942	7	5	10	6	13	3	18	2	8	3	22	
S. District. Camberwell	235,344	21	4	16	2	19	4	22	1	16	4	24	
S. District. Greenwich	165,413	14	7	19	5	20	3	15	5	16	3	10	
S. District. Lewisham	92,647	6	—	6	2	17	1	4	3	8	4	4	
S. District. Woolwich	40,848	—	—	—	—	—	—	—	—	—	—	2	
S. District. Plumstead	88,539	10	3	6	2	6	3	2	3	2	1	6	
S. District. Port of London	—	—	—	—	—	—	—	—	—	—	—	—	

[a] Totals of actual *notifications*.
[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population

Sanitary Areas.		Population (1891).	Enteric Fever. Weekly Statement, 1st Quarter, 18								
			Jan. 7.		Jan. 14.		Jan. 21.		Jan. 28.		F
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.
London		4,232,118	*48	11	57	10	49	7	47	4	61
(*Administrative County*)			†47	—	57	—	49	—	44	—	59
W. District.	Kensington	166,308	2	—	3	—	1	1	—	—	1
	Fulham	91,639	1	1	—	—	—	—	—	—	1
	Hammersmith	97,239	2	—	2	—	3	—	2	—	—
	Paddington	117,846	1	1	—	—	1	—	1	—	—
	Chelsea	96,253	2	1	2	1	2	—	1	—	1
	St. George, Hanover Sq.*	78,599	1	—	5	—	1	—	—	1	—
	Westminster	55,539	—	1	1	—	—	—	—	—	—
	St. James, Westminster	24,995	—	—	—	—	—	—	1	—	—
N. District.	St. Marylebone	142,404	2	—	—	—	2	1	1	—	1
	Hampstead	68,414	—	—	1	—	—	—	—	—	—
	St. Pancras	234,379	1	1	3	—	1	—	4	—	2
	Islington	319,143	5	—	4	2	5	—	2	—	4
	Hackney	229,542	6	1	11	—	2	—	5	—	3
Central District.	St. Giles and St. George, Bloomsbury.	39,782	1	—	—	—	—	—	2	—	—
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—
	Strand†	25,217	—	—	—	—	—	—	4	—	—
	Holborn‡	34,043	—	—	—	—	—	—	—	—	2
	Clerkenwell	66,216	—	—	2	—	2	—	—	—	—
	St. Luke, Middlesex	42,440	—	—	—	—	—	—	—	—	—
	London, City of§	37,583	—	—	—	—	1	—	—	—	—
E. District.	Shoreditch	124,009	—	—	2	—	1	—	2	—	—
	Bethnal Green	129,132	1	1	1	—	1	1	3	—	2
	Whitechapel‖	74,420	2	—	—	—	—	—	—	—	1
	St. George-in-the-East	45,795	—	—	—	—	2	1	—	—	—
	Limehouse	57,376	—	—	—	1	1	—	2	—	—
	Mile End Old Town	107,592	—	—	1	1	—	—	1	—	1
	Poplar	166,748	2	—	5	1	7	—	—	—	2
S. District.	St. Saviour, Southwark	27,177	—	—	1	—	—	—	—	—	—
	St. George, Southwark	59,712	—	—	—	—	2	—	2	—	1
	Newington	115,804	—	—	4	—	—	—	1	—	4
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—
	Bermondsey	84,682	1	—	1	—	2	—	1	—	—
	Rotherhithe	39,255	—	—	—	—	—	—	—	1	1
	Lambeth	275,203	6	1	—	2	5	—	2	—	4
	Battersea	150,558	4	—	1	—	2	1	3	—	2
	Wandsworth	156,942	4	1	2	—	1	2	1	—	4
	Camberwell	235,344	1	—	1	1	2	—	1	—	—
	Greenwich	165,413	2	—	2	1	—	—	2	1	1
	Lewisham	92,647	—	—	1	—	—	—	2	—	2
	Woolwich	40,848	1	1	—	—	1	—	—	—	—
	Plumstead	88,539	—	1	1	—	1	—	1	1	—
	Port of London	—	—	—	—	—	—	—	—	—	—

* Totals of actual *notifications*.

† Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of retu of duplicate notifications.

‡ Including St. Peters, Westminster (population, 235). † Including Middle Temple (p

ENTERIC FEVER—*continued.*

Weekly Statement, 1st quarter, 1893—*continued.*													Totals for 1st Quarter, 1893.		Sanitary Areas.
b. 18.		Feb. 25.		March 4.		March 11.		March 18.		March 25.		April 1.			
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
7	34	9	41	12	40	11	30	5	38	7	24	6	554	102	London.
—	*33*	—	*35*	—	*40*	—	*30*	—	*32*	—	*23*	—	*532*	—	(*Administrative County.*)
—	—	—	1	—	—	—	—	—	1	—	2	—	15	1	Kensington.
1	1	—	2	—	1	2	—	—	—	—	—	—	11	4	Fulham.
—	2	—	1	2	2	—	2	—	—	—	—	—	19	2	Hammersmith.
1	—	—	2	—	1	—	—	—	—	—	2	—	8	2	Paddington.
1	2	—	1	—	2	—	1	—	1	—	—	—	23	4	Chelsea.
—	—	—	—	—	—	—	1	—	—	1	1	—	11	2	St. George, Hanover Sq.*
—	1	—	—	—	—	—	1	—	—	—	—	—	3		Westminster.
—	—	—	—	—	1	—	1	1	—	—	—	—	3		St. James, Westminster.
—	—	—	—	—	—	—	—	—	2	—	1	1	11	2	St. Marylebone.
—	—	—	1	—	—	—	—	—	1	—	—	—	3		Hampstead.
—	1	1	2	—	3	1	—	—	—	—	—	—	22	4	St. Pancras.
1	6	2	2	—	3	1	5	1	5	—	2	1	47	9	Islington.
—	2	—	1	—	4	—	3	2	3	—	—	—	42	4	Hackney.
—	—	—	—	—	—	—	—	—	—	—	—	—	5	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	Strand.†
—	1	—	1	2	—	—	—	—	—	—	1	—	5	2	Holborn.‡
—	—	1	—	—	—	—	1	—	2	—	1	—	10	1	Clerkenwell.
—	1	—	—	2	—	—	1	—	—	—	—	—	5	2	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	London, City of.§
1	2	—	2	—	—	—	1	—	—	—	—	—	13	1	Shoreditch.
—	2	—	1	—	—	—	—	—	—	—	—	—	11	2	Bethnal Green.
—	1	—	2	—	1	—	—	—	3	1	1	—	13	1	Whitechapel.‖
—	—	—	—	—	1	—	—	—	—	—	—	—	3	2	St. George-in-the-East.
—	—	—	—	1	—	—	—	—	1	—	1	—	12	3	Limehouse.
—		—	—	—	2	1	1	—	2	—	—	1	11	3	Mile End Old Town.
—		—	3	—	1	—	—	—	2	2	1	—	33	3	Poplar.
—		1	—	—	—	—	—	—	—	—	—	—	3	1	St. Saviour, Southwark.
—		—	1	1	1	—	—	—	1	—	1	—	12	1	St. George, Southwark.
—		—	3	—	—	1	1	—	2	1	2	1	17	4	Newington.
—		—	1	—	—	—	—	—	1	—	—	—	2	—	St. Olave, Southwark.
—		—	1	1	—	—	—	—	—	—	—	—	6	1	Bermondsey.
—		—	—	1	2	—	—	—	—	—	1	—	8	2	Rotherhithe.
1		1	2	—	5	2	5	—	1	—	1	—	37	9	Lambeth.
1		—	3	1	5	2	—	—	2	—	2	—	30	6	Battersea.
—		—	5	1	—	—	3	—	1	1	—	—	31	6	Wandsworth.
—		2	1	—	4	—	2	—	5	1	2	2	34	6	Camberwell.
—	1	—	—	—	1	1	—	—	—	—	—	—	10	4	Clap[illegible]
—	2	—	1	—	—	—	—	—	1	—	1	—	10	1	
—	1	1	—	—	—	—	1	—	—	—	—	—			
—	—	—	1	—	—	—	—	1	1	—	—	—			
—	—	—	—	—	—	—	—	—	—	—	1	—			

cluding Gray's Inn (population, 253), Lincoln's Inn (population, 1
Inn (population, 21), and Furnival's Inn (population, 121).
§ Including Inner Temple (population, 96). ‖ Inclu[illegible]

Sanitary Areas.		Population (1891).	Enteric Fever—*continued.* Weekly Statement, 2nd Quarter, 1893.									
			April 8.		April 15.		April 22.		April 29.		May 6.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
London		4,232,118	[a]52	5	33	8	39	7	45	8	37	12
(*Administrative County*)			[b]30	—	32	—	38	—	43	—	37	—
W. District.	Kensington	166,308	1	—	1	—	—	—	1	1	2	—
	Fulham	91,639	—	—	1	—	—	—	—	—	1	—
	Hammersmith	97,239	—	—	—	—	1	—	1	—	—	—
	Paddington	117,846	—	—	3	—	2	1	1	1	3	—
	Chelsea	96,253	—	—	2	—	—	—	—	—	1	—
	St. George, Hanover Sq.*	78,599	1	—	—	—	—	—	1	—	2	1
	Westminster	55,539	—	—	—	—	—	—	1	—	2	1
	St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—	—
N. District.	St. Marylebone	142,404	4	—	1	—	—	—	2	—	—	1
	Hampstead	68,416	—	—	—	—	2	1	—	—	—	—
	St. Pancras	234,379	6	—	—	—	—	—	2	—	1	—
	Islington	319,143	6	2	1	—	3	—	3	1	1	1
	Hackney	229,542	6	—	4	2	2	1	2	1	2	—
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	1	—	—	—
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—
	Strand†	25,217	—	—	—	—	—	—	—	—	—	—
	Holborn‡	34,043	—	—	—	—	—	—	—	—	—	—
	Clerkenwell	66,216	1	—	2	—	1	—	4	—	—	—
	St. Luke, Middlesex	42,440	—	—	1	1	1	—	1	—	5	1
	London, City of §	37,583	—	—	—	—	1	—	—	—	—	—
E. District.	Shoreditch	124,009	1	—	—	—	—	—	4	—	—	1
	Bethnal Green	129,132	1	—	2	—	1	—	2	—	3	—
	Whitechapel‖	74,420	1	—	—	—	2	—	1	1	—	—
	St. George-in-the-East	45,795	—	—	—	—	—	—	2	—	—	—
	Limehouse	57,376	4	—	2	—	1	—	—	—	1	—
	Mile End Old Town	107,592	—	—	—	—	3	—	—	—	1	—
	Poplar	166,748	3	1	4	1	8	1	8	2	5	2
S. District.	St. Saviour, Southwark	27,177	1	—	—	1	—	—	—	—	1	—
	St. George, Southwark	59,712	1	1	—	—	—	—	1	1	—	—
	Newington	115,804	—	—	1	—	—	—	—	—	—	—
	St. Olave, Southwark	12,723	—	—	—	1	1	—	1	—	—	1
	Bermondsey	84,682	1	—	1	—	—	—	1	—	—	—
	Rotherhithe	39,255	1	—	—	—	—	—	—	—	—	—
	Lambeth	275,203	3	—	2	1	1	1	1	—	1	—
	Battersea	150,558	1	1	1	—	2	—	—	—	1	1
	Wandsworth	156,942	3	—	1	1	1	1	2	—	—	—
	Camberwell	235,344	2	—	2	—	2	—	—	—	3	1
	Greenwich	165,413	3	—	—	—	3	1	1	—	1	—
	Lewisham	92,647	—	—	—	—	1	—	1	—	—	—
	Woolwich	40,848	—	—	—	—	—	—	—	—	—	—
	Plumstead	88,539	—	—	1	—	—	—	—	—	—	—
	Port of London	—	1	—	—	—	—	—	—	—	—	—

[a] Totals of actual *notifications*.
[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and
of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population

Sanitary Areas.		Population (1891).	Enteric Fever—*continued.* Weekly Statement, 3rd Quarter, 1893.									
			July 8.		July 15.		July 22.		July 29.		Aug. 5.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
London		4,232,118	*62	13	80	15	64	8	80	13	80	21
(*Administrative County*)		—	*62	—	78	—	63	—	79	—	78	—
W. District.	Kensington	166,308	—	—	1	—	1	—	1	1	1	1
	Fulham	91,639	1	—	4	—	1	—	1	—	2	—
	Hammersmith	97,235	—	—	3	—	3	—	1	—	2	1
	Paddington	117,846	—	—	—	—	1	—	1	1	2	—
	Chelsea	96,253	—	—	2	—	1	—	—	—	—	—
	St. George, Hanover Sq.*	78,599	—	—	3	—	—	—	3	—	—	—
	Westminster	55,539	1	1	1	—	—	—	—	—	2	—
	St. James, Westminster	24,905	1	—	—	—	—	—	—	—	—	1
N. District.	St. Marylebone	142,404	2	—	—	1	1	1	1	—	1	—
	Hampstead	68,416	1	—	—	—	4	—	2	—	—	—
	St. Pancras	234,379	—	1	1	1	3	—	6	—	2	1
	Islington	319,143	2	1	4	—	2	1	5	—	2	—
	Hackney	229,542	7	—	7	—	8	2	12	1	10	4
Central District.	St. Giles and St. George Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	1
	St. Martin-in-the-Fields	14,616	—	1	—	—	—	—	—	—	—	—
	Strand†	25,217	—	—	—	—	—	—	—	—	—	—
	Holborn‡	34,043	1	1	—	—	—	—	2	—	2	—
	Clerkenwell	66,216	2	—	1	1	1	—	2	—	1	1
	St. Luke, Middlesex	42,440	—	1	1	—	2	—	—	1	2	1
	London, City of§	37,583	—	—	—	—	—	—	2	—	2	—
E. District.	Shoreditch	124,009	3	—	4	1	2	1	4	—	3	—
	Bethnal Green	129,132	2	—	6	2	2	1	1	—	5	2
	Whitechapel	74,420	—	—	1	—	—	—	1	—	1	—
	St. George-in-the-East	45,795	—	—	—	—	1	—	—	—	1	—
	Limehouse	57,376	1	—	5	—	3	1	2	1	2	—
	Mile End Old Town	107,592	4	2	5	1	3	1	3	—	6	1
	Poplar	166,748	13	1	9	2	8	—	13	4	16	7
S. District.	St. Saviour, Southwark	27,177	1	—	—	—	2	—	—	1	1	—
	St. George, Southwark	59,712	—	—	—	—	1	—	2	—	1	1
	Newington	115,804	3	—	—	1	—	—	3	1	1	—
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—
	Bermondsey	84,682	1	—	—	—	1	—	—	—	—	—
	Rotherhithe	39,255	1	—	2	—	1	—	—	—	—	—
	Lambeth	275,203	3	2	4	2	1	—	3	—	3	—
	Battersea	150,558	1	—	1	—	4	—	1	1	1	—
	Wandsworth	156,942	—	—	5	—	2	1	2	—	1	—
	Camberwell	235,344	3	1	6	1	3	—	—	—	5	—
	Greenwich	165,413	1	1	1	—	1	—	2	2	1	—
	Lewisham	92,647	—	—	3	—	—	—	—	—	—	—
	Woolwich	48,848	—	—	—	1	—	—	1	—	—	—
	Plumstead	88,539	1	—	—	1	1	—	3	—	1	—
	Port of London	—	—	—	—	—	—	—	—	—	—	—

* Totals of actual *notifications.*

† Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and of duplicate notifications.

‡ Including St. Peter's, We[illegible] (population, 238). † Including Middle Temple (population,

Sanitary Areas.		Population (1891).	Enteric Fever—*continued.* Weekly Statement, 4th Quarter, 1893.											
			Oct. 7.		Oct. 14.		Oct. 21.		Oct. 28.		Nov. 4.		N	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	
London		4,232,118	[a]93	9	96	21	98	16	74	17	109	12	11	
(*Administrative County*)			[a]96	—	94	—	97	—	73	—	102	—	1	
W. District.	Kensington	166,508	4	1	—	1	4	—	8	—	14	3		
	Fulham	91,620	4	—	4	1	3	1	1	1	2	—		
	Hammersmith	97,239	—	—	1	—	—	1	4	—	1	—		
	Paddington	117,846	1	—	1	1	1	—	—	1	2	—		
	Chelsea	96,253	2	—	3	—	2	2	2	1	1	—		
	St. George, Hanover Sq.*	78,599	3	—	1	2	—	—	—	—	1	—		
	Westminster	55,539	—	—	4	—	—	—	2	—	—	—		
	St. James, Westminster	24,995	1	1	—	—	1	—	—	—	—	—		
N. District.	St. Marylebone	142,404	2	—	3	1	3	—	1	—	2	1		
	Hampstead	68,416	1	—	1	—	3	—	1	—	—	—		
	St. Pancras	234,379	1	—	1	1	3	—	4	1	7	—		
	Islington	319,143	4	—	8	2	8	—	5	2	10	—		
	Hackney	229,542	11	2	12	4	9	1	9	3	7	1	1	
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	3	—	2	—	2	—	—	—		
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	1	—	1	—		
	Strand†	25,217	—	—	—	—	1	—	—	1	—	—		
	Holborn‡	34,043	1	—	—	—	3	1	3	—	1	2		
	Clerkenwell	66,216	—	—	2	—	3	1	—	—	3	1		
	St. Luke, Middlesex	42,440	—	—	—	—	1	—	2	—	—	—		
	London, City of§	37,583	1	—	1	—	2	—	—	—	3	—		
E. District.	Shoreditch	124,009	3	—	4	—	2	—	—	—	3	—		
	Bethnal Green	129,132	3	1	5	—	5	—	2	1	3	1		
	Whitechapel‖	74,420	1	1	1	—	4	—	1	—	—	—		
	St. George-in-the-East	45,795	4	—	—	—	1	—	—	—	—	—		
	Limehouse	57,376	6	—	4	1	3	2	5	—	—	—		
	Mile End Old Town	107,592	5	—	6	2	6	—	2	1	5	1		
	Poplar	166,748	15	1	13	1	5	2	3	2	10	—		
S. District.	St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—	1	—		
	St. George, Southwark	59,712	—	—	3	—	1	—	1	1	—	—		
	Newington	115,804	—	1	3	—	1	—	—	—	6	—		
	St. Olave, Southwark	12,723	—	—	1	—	—	—	—	—	—	—		
	Bermondsey	84,682	1	—	1	—	2	—	—	—	2	—		
	Rotherhithe	39,255	—	—	—	—	—	—	—	—	—	—		
	Lambeth	275,203	2	—	4	—	3	2	1	1	7	1		
	Battersea	160,558	4	—	4	—	2	—	3	—	2	1		
	Wandsworth	156,942	3	—	—	2	4	1	2	—	6	—		
	Camberwell	235,344	3	—	—	—	5	1	4	1	3	2		
	Greenwich	165,413	2	1	—	1	3	1	4	—	3	3		
	Lewisham	92,647	3	—	1	1	—	—	—	—	—	—		
	Woolwich	40,848	—	—	—	—	—	—	—	—	1	—		
	Plumstead	88,539	2	—	1	—	2	—	1	—	2	—		
	Port of London	—	—	—	—	—	—	—	—	—	—	—		

[a] Totals of actual *notifications*.
[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of return of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (pop

ENTERIC FEVER—*continued.*

Weekly Statement, 4th Quarter, 1893—*continued.*

Nov. 25.		Dec. 2.		Dec. 9.		Dec. 16.		Dec. 23.		Dec. 30.		Totals for 4th Quarter, 1893.		Grand Totals for Year 1893.		Sanitary Areas.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
162	24	138	24	118	33	92	21	69	23	81	17	1,383	258	3,746	675	London.
153	—	*135*	—	*113*	—	*91*	—	*69*	—	*79*	—	*1,350*	—	*3,660*	—	*(Administrative County.)*
5	1	5	—	3	1	2	1	3	—	2	1	60	13	103	17	Kensington.
2	1	—	—	—	3	—	—	—	—	—	—	21	9	61	17	Fulham.
2	—	—	1	—	—	1	—	5	1	3	3	22	7	68	15	Hammersmith.
4	2	10	2	1	2	—	—	1	2	5	—	29	10	70	21	Paddington.
1	—	6	1	2	1	—	—	1	—	1	1	25	6	79	17	Chelsea.
3	1	5	—	2	1	1	2	1	1	3	—	25	7	71	12	St. George, Hanover Sq.*
1	—	4	2	—	—	1	—	—	1	1	—	18	3	45	7	Westminster.
4	—	—	—	1	—	—	1	—	—	1	—	12	3	22	6	St. James, Westminster.
12	1	7	—	3	1	3	—	1	2	3	1	48	9	99	20	St. Marylebone.
1	1	1	1	2	—	1	2	—	1	2	—	17	6	36	8	Hampstead.
9	1	6	2	8	1	8	—	5	—	1	1	67	10	184	27	St. Pancras.
11	2	6	1	12	2	12	1	7	4	4	2	105	18	270	47	Islington.
11	2	8	3	12	2	11	1	10	2	4	1	146	27	369	53	Hackney.
2	—	3	—	1	—	1	1	2	1	—	—	18	2	33	6	St. Giles and St. George, Bloomsbury.
—	—	—	—	1	—	1	—	—	—	—	—	4	—	6	1	St. Martin-in-the-Fields.
2	—	—	—	—	—	1	—	—	—	—	—	5	1	12	1	Strand.†
3	2	2	—	1	1	2	—	—	—	1	—	20	7	41	13	Holborn.‡
—	1	—	—	3	—	1	1	—	—	2	—	24	4	71	10	Clerkenwell.
—	—	—	—	—	—	—	—	1	—	—	—	4	—	32	12	St. Luke, Middlesex.
1	—	—	—	1	—	2	—	—	—	2	—	14	—	28	—	London, City of.§
4	1	2	2	3	—	—	—	—	—	—	—	26	3	121	16	Shoreditch.
3	—	7	1	3	—	6	1	2	3	12	1	62	13	140	25	Bethnal Green.
5	1	1	—	—	1	—	—	—	1	1	1	20	5	65	8	Whitechapel.‖
7	—	1	—	1	—	1	—	—	—	1	1	24	1	47	4	St. George-in-the-East.
5	—	4	—	4	1	1	—	1	—	1	—	37	5	115	18	Limehouse.
7	1	4	—	3	1	1	—	2	—	2	1	53	9	151	29	Mile End Old Town.
11	1	16	1	11	3	10	2	5	—	7	—	121	13	396	62	Poplar.
3	—	—	—	1	—	1	—	—	—	1	—	8	—	21	3	St. Saviour, Southwark.
3	—	1	—	1	—	—	—	—	1	—	—	11	2	42	13	St. George, Southwark.
—	1	3	—	2	1	—	—	—	—	3	1	20	4	68	13	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	6	2	St. Olave, Southwark.
3	—	2	—	—	1	—	—	2	—	3	—	21	3	48	8	Bermondsey.
1	—	2	—	3	2	—	—	1	—	—	—	7	2	27	8	Rotherhithe.
5	—	8	1	1	2	4	2	2	—	2	—	41	10	160	36	Lambeth.
7	2	5	2	11	—	6	2	1	1	4	—	57	9	130	22	Battersea.
6	—	9	1	4	1	1	—	—	—	3	—	43	6	115	18	Wandsworth.
4	1	1	—	4	—	4	—	4	1	1	1	42	8	142	27	Camberwell.
10	—	3	2	7	3	6	1	6	—	2	—	56	13	118	28	Greenwich.
2	—	1	—	—	—	—	1	1	1	2	—	14	3	45	9	Lewisham.
1	—	1	—	3	1	1	1	5	—	1	—	13	2	29	5	Woolwich.
1	1	3	1	2	1	2	1	—	—	—	1	20	5	43	11	Plumstead.
—	—	1	—	1	—	—	—	—	—	—	—	2	—	17	—	Port of London.

‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 39).

§ Including Inner Temple (population, 96). ‖ Including Tower of London (population, 868).

* 82300.

Sanitary Areas.	Population (1891).	Simple Continued Fever. Weekly Statement, 1st Quarter, 1893. Jan. 7. Cases.	Jan. 7. Deaths.	Jan. 14. Cases.	Jan. 14. Deaths.	Jan. 21. Cases.	Jan. 21. Deaths.	Jan. 28. Cases.	Jan. 28. Deaths.	Feb. 4. Cases.	Feb. 4. Deaths.
London	4,232,118	*6	—	3	—	1	1	2	—	8	1
(Administrative County)	—	*b6*	—	*3*	—	*1*	—	*2*	—	*6*	—
W. District. Kensington	166,308	—	—	—	—	—	—	—	—	1	—
W. District. Fulham	91,632	—	—	—	—	—	—	—	—	—	—
W. District. Hammersmith	97,239	—	—	—	—	—	—	—	—	—	—
W. District. Paddington	117,846	1	—	—	—	—	—	—	—	—	—
W. District. Chelsea	96,253	—	—	—	—	—	—	—	—	—	—
W. District. St. George, Hanover Sq.*	78,599	—	—	—	—	—	1	—	—	—	—
W. District. Westminster	55,539	—	—	—	—	—	—	—	—	—	—
W. District. St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—	—
N. District. St. Marylebone	142,404	—	—	—	—	—	—	—	—	1	1
N. District. Hampstead	68,416	—	—	—	—	—	—	—	—	—	—
N. District. St. Pancras	234,379	—	—	—	—	—	—	—	—	—	—
N. District. Islington	319,143	—	—	—	—	—	—	—	—	—	—
N. District. Hackney	229,542	—	—	—	—	—	—	—	—	1	—
Central District. St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—
Central District. St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—
Central District. Strand†	25,217	—	—	—	—	—	—	—	—	—	—
Central District. Holborn‡	34,043	—	—	—	—	—	—	—	—	—	—
Central District. Clerkenwell	66,216	—	—	—	—	—	—	1	—	—	—
Central District. St. Luke, Middlesex	42,449	—	—	—	—	—	—	—	—	—	—
Central District. London, City of§	37,583	—	—	—	—	—	—	—	—	—	—
E. District. Shoreditch	124,009	—	—	—	—	—	—	—	—	—	—
E. District. Bethnal Green	129,132	—	—	—	—	—	—	—	—	—	—
E. District. Whitechapel‖	74,420	—	—	—	—	—	—	—	—	—	—
E. District. St. George-in-the-East	45,795	—	—	—	—	—	—	—	—	—	—
E. District. Limehouse	57,376	—	—	—	—	—	—	—	—	—	—
E. District. Mile End Old Town	107,592	—	—	—	—	—	—	—	—	—	—
E. District. Poplar	166,748	—	—	1	—	—	—	1	—	—	—
S. District. St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—	—	—
S. District. St. George, Southwark	59,712	—	—	—	—	—	—	—	—	—	—
S. District. Newington	115,804	—	—	—	—	—	—	—	—	—	—
S. District. St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—
S. District. Bermondsey	84,682	—	—	—	—	—	—	—	—	—	—
S. District. Rotherhithe	39,255	—	—	—	—	—	—	—	—	—	—
S. District. Lambeth	275,203	—	—	1	—	1	—	—	—	3	—
S. District. Battersea	150,558	5	—	1	—	—	—	—	—	—	—
S. District. Wandsworth	156,942	—	—	—	—	—	—	—	—	—	—
S. District. Camberwell	235,344	—	—	—	—	—	—	—	—	—	—
S. District. Greenwich	165,413	—	—	—	—	—	—	—	—	—	—
S. District. Lewisham	92,647	—	—	—	—	—	—	—	—	—	—
S. District. Woolwich	40,818	—	—	—	—	—	—	—	—	—	—
S. District. Plumstead	88,539	—	—	—	—	—	—	—	—	—	—
S. District. Port of London	—	—	—	—	—	—	—	—	—	—	—

* Totals of actual *notifications*.
b Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and de
of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population,

SIMPLE CONTINUED FEVER—*continued.*

Weekly Statement, 1st Quarter, 1893—*continued.*														Totals for 1st Quarter, 1893.		Sanitary Areas.
b. 18.		Feb. 25.		Mar. 4.		Mar. 11.		Mar. 18.		Mar. 25.		April 1.				
Deaths.		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
—		6	—	4	—	—	—	3	—	2	—	1	1	38	3	London.
—		5	—	4	—	—	—	3	—	2	—	1	—	38	—	(*Administrative County.*)
—		—	—	—	—	—	—	—	—	—	—	—	—	1	—	Kensington.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Fulham.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Hammersmith.
—		—	—	—	—	—	—	—	—	—	—	—	—	1	—	Paddington.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Chelsea.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	1	St. George, Hanover Sq.*
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Westminster.
—		1	—	—	—	—	—	—	—	—	—	—	1	1	1	St. James, Westminster.
—		—	—	—	—	—	—	—	—	—	—	—	—	1	1	St. Marylebone.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Hampstead.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Pancras.
—		2	—	1	—	—	—	—	—	—	—	—	—	3	—	Islington.
—		—	—	—	—	—	—	—	—	—	—	—	—	1	—	Hackney.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Giles and St. George, Bloomsbury.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Martin-in-the-Fields.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Strand.†
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Holborn.‡
—		—	—	—	—	—	—	—	—	—	—	—	—	3	—	Clerkenwell.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Luke, Middlesex.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	London, City of.§
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Shoreditch.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Bethnal Green.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Whitechapel.‖
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George-in-the-East.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Limehouse.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Mile End Old Town.
—		2	—	—	—	—	—	2	—	—	—	—	—	7	—	Poplar.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Saviour, Southwark.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George, Southwark.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Newington.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Bermondsey.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Rotherhithe.
—		1	—	2	—	—	—	1	—	1	—	1	—	11	—	Lambeth.
—		—	—	—	—	—	—	—	—	—	—	—	—	6	—	Battersea.
—		—	—	—	—	—	—	—	—	—	—	—	—	1	—	Wandsworth.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Camberwell.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Greenwich.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lewisham.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Woolwich.
—		—	—	1	—	—	—	—	—	1	—	—	—	2	—	Plumstead.
—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	Port of London.

‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 51), and Furnival's Inn (population, 121).
§ Including Inner Temple (population, 96). ‖ Including Tower of London (population, 889).

	Sanitary Areas.	Population (1891).	Enteric Fever—*continued.* Weekly Statement, 2nd Quarter, 18								
			April 8.		April 15.		April 22.		April 29.		M
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.
	London	4,232,118	[a]53	5	33	8	39	7	45	8	37
	(*Administrative County*)	-	[b]50	—	32	—	32	—	42	—	37
W. District.	Kensington	166,308	1	—	1	—	—	—	1	1	2
	Fulham	91,639	—	—	1	—	—	—	—	—	1
	Hammersmith	97,239	—	—	—	—	1	—	1	—	—
	Paddington	117,846	—	—	3	—	2	1	1	1	1
	Chelsea	96,253	—	—	2	—	—	—	—	—	1
	St. George, Hanover Sq.*	78,599	1	—	—	—	—	—	1	—	2
	Westminster	53,539	—	—	—	—	—	—	1	—	1
	St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—
N. District.	St. Marylebone	142,404	4	—	1	—	—	—	2	—	—
	Hampstead	68,416	—	—	—	—	2	1	—	—	—
	St. Pancras	234,379	6	—	—	—	—	—	2	—	1
	Islington	319,143	6	2	1	—	3	—	3	1	1
	Hackney	229,542	6	—	4	2	2	1	2	1	2
Central District.	St. Giles and St. George, Bloomsbury	39,782	—	—	—	—	—	—	1	—	—
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—
	Strand†	25,217	—	—	—	—	—	—	—	—	—
	Holborn‡	34,043	—	—	—	—	—	—	—	—	—
	Clerkenwell	66,216	1	—	2	—	1	—	4	—	—
	St. Luke, Middlesex	42,440	—	—	1	1	1	—	1	—	3
	London, City of §	37,583	—	—	—	—	1	—	—	—	—
E. District.	Shoreditch	124,009	1	—	—	—	—	—	4	—	—
	Bethnal Green	129,132	1	—	2	—	1	—	2	—	3
	Whitechapel‖	74,420	1	—	—	—	2	—	1	1	—
	St. George-in-the-East	45,795	—	—	—	—	—	—	2	—	—
	Limehouse	57,376	4	—	2	—	1	—	—	—	1
	Mile End Old Town	107,592	—	—	—	—	3	—	—	—	1
	Poplar	166,748	3	1	4	1	8	1	8	2	3
S. District.	St. Saviour, Southwark	27,177	1	—	—	1	—	—	—	—	1
	St. George, Southwark	59,712	1	1	—	—	—	—	1	1	—
	Newington	115,804	—	—	1	—	—	—	—	—	—
	St. Olave, Southwark	12,723	—	—	—	1	1	—	1	—	—
	Bermondsey	84,682	1	—	1	—	—	—	1	—	—
	Rotherhithe	39,255	1	—	—	—	—	—	—	—	—
	Lambeth	275,203	3	—	2	1	1	1	1	—	1
	Battersea	150,558	1	1	1	—	2	—	—	—	1
	Wandsworth	156,942	3	—	1	1	1	1	2	—	—
	Camberwell	235,344	2	—	2	—	2	—	—	—	3
	Greenwich	165,413	3	—	—	—	3	1	1	—	1
	Lewisham	92,647	—	—	—	—	1	—	1	—	—
	Woolwich	40,848	—	—	—	—	—	—	—	—	—
	Plumstead	88,539	—	—	1	—	—	—	—	—	—
	Port of London	—	1	—	—	—	—	—	—	—	—

[a] Totals of actual *notifications.*
[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (popula

ENTERIC FEVER—*continued.*

Weekly Statement, 2nd Quarter, 1893—*continued.*												Totals for 2nd Quarter, 1893.		Sanitary Areas.
May 27.		June 3.		June 10.		June 17.		June 24.		July 1.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
42	6	34	7	41	8	74	6	149	15	105	16	752	110	London.
41	—	*34*	—	*42*	—	*73*	—	*148*	—	*98*	—	*735*	—	(*Administrative County.*)
1	—	3	—	—	—	—	—	3	—	1	—	14	1	Kensington.
1	—	—	—	2	—	2	—	2	1	—	—	9	1	Fulham.
—	—	—	—	1	—	1	—	3	2	—	—	7	2	Hammersmith.
1	—	2	—	1	1	—	—	2	—	1	—	18	3	Paddington.
—	—	1	—	1	—	—	1	1	—	1	—	12	2	Chelsea.
1	—	—	—	2	—	3	—	1	—	2	—	16	1	St. George, Hanover Sq.*
—	—	—	—	—	—	6	—	3	—	—	—	14	2	Westminster.
—	—	—	—	—	—	—	—	1	—	—	—	1	—	St. James, Westminster.
—	1	—	1	1	—	—	—	1	—	6	1	19	4	St. Marylebone.
1	—	1	—	—	—	—	—	—	—	1	—	5	1	Hampstead.
3	2	1	—	—	1	4	—	14	—	10	2	45	5	St. Pancras.
1	—	—	1	1	—	10	1	5	—	8	1	48	8	Islington.
6	—	4	—	2	1	3	—	7	—	8	—	57	6	Hackney.
—	—	—	—	—	—	—	—	1	1	—	—	2	1	St. Giles and St. George, Bloomsbury.
1	—	—	—	1	—	—	—	—	—	—	—	2	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	Strand.†
2	—	—	—	—	—	1	—	3	—	2	—	8	—	Holborn.‡
—	—	—	—	1	—	5	—	2	—	2	—	19	—	Clerkenwell.
—	—	1	—	1	—	—	—	1	—	1	—	13	2	St. Luke, Middlesex.
—	—	1	—	—	—	—	—	3	—	—	—	6	—	London, City of.§
—	—	1	—	2	—	5	—	9	—	5	2	30	3	Shoreditch.
1	—	1	—	5	1	—	—	4	—	9	1	31	2	Bethnal Green.
2	—	1	—	—	—	1	—	—	—	1	—	9	1	Whitechapel.‖
4	—	—	—	—	—	—	—	—	—	2	—	12	—	St. George-in-the-East.
1	—	1	—	4	—	3	—	8	1	1	2	31	3	Limehouse.
—	1	3	2	—	—	2	—	12	—	7	2	34	6	Mile End Old Town.
5	1	—	—	3	2	8	2	30	3	13	2	101	21	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	2	1	St. Saviour, Southwark.
1	—	—	—	—	—	—	—	4	2	—	—	7	5	St. George, Southwark.
1	1	2	1	2	—	—	—	4	1	1	—	12	3	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	2	2	St. Olave, Southwark.
—	—	—	—	1	1	3	—	—	—	3	—	10	1	Bermondsey.
1	—	—	—	1	—	—	—	2	—	—	2	5	2	Rotherhithe.
2	—	3	1	2	1	5	1	5	1	6	—	40	8	Lambeth.
4	—	2	—	1	—	1	—	—	1	2	—	23	3	Battersea.
—	—	2	—	—	—	2	—	3	—	1	—	16	2	Wandsworth.
2	—	—	1	3	—	4	1	3	—	4	1	27	5	Camberwell.
—	—	2	—	—	—	1	—	1	—	3	—	16	1	Greenwich.
—	—	—	—	—	—	2	—	4	1	2	—	10	1	Lewisham.
—	—	1	—	1	—	2	—	4	—	1	—	9	—	Woolwich.
—	—	1	—	—	—	—	—	—	1	—	—	3	1	Plumstead.
—	—	—	—	2	—	—	—	3	—	1	—	7	—	Port of London.

*ding Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple (population, 21), and Furnival's Inn (population, 121).
†Including Inner Temple (population, 96). ‖ Including Tower of London (population, 868).

ENTERIC FEVER—*continued.*

Weekly Statement, 3rd Quarter, 189

Sanitary Areas.	Population (1891).	July 8.		July 15.		July 22.		July 29.		Aug 5.	
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
London	4,232,118	[a]62	13	80	13	64	8	80	13	80	11
(*Administrative County*)	—	[a]62	—	78	—	69	—	79	—	78	—
W. District. Kensington	166,308	—	—	1	—	1	—	1	1	1	1
W. District. Fulham	91,639	1	—	4	—	1	—	1	—	2	—
W. District. Hammersmith	97,235	—	—	3	—	3	—	1	—	1	1
W. District. Paddington	117,846	—	—	—	—	1	—	1	1	2	—
W. District. Chelsea	96,253	—	—	2	—	1	—	—	—	—	—
W. District. St. George, Hanover Sq.*	78,599	—	—	3	—	—	—	3	—	—	—
W. District. Westminster	55,539	1	1	1	—	—	—	—	—	1	—
W. District. St. James, Westminster	24,993	1	—	—	—	—	—	—	—	—	1
N. District. St. Marylebone	142,404	2	—	—	1	1	1	1	—	1	—
N. District. Hampstead	68,416	1	—	—	—	4	—	2	—	—	—
N. District. St. Pancras	234,379	—	1	1	1	3	—	6	—	2	1
N. District. Islington	319,143	9	1	4	—	2	1	5	—	1	—
N. District. Hackney	229,542	7	—	7	—	8	2	12	1	10	8
Central District. St. Giles and St. George Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—
Central District. St. Martin-in-the-Fields	14,616	—	1	—	—	—	—	—	—	—	—
Central District. Strand†	25,217	—	—	—	—	—	—	—	—	—	—
Central District. Holborn‡	34,043	1	1	—	—	—	—	2	—	2	—
Central District. Clerkenwell	66,216	2	—	1	1	1	—	2	—	1	1
Central District. St. Luke, Middlesex	42,440	—	1	1	—	2	—	—	1	2	1
Central District. London, City of§	37,583	—	—	—	—	—	—	2	—	2	—
E. District. Shoreditch	124,009	3	—	4	1	2	1	4	—	3	—
E. District. Bethnal Green	129,132	2	—	6	2	2	1	1	—	5	1
E. District. Whitechapel‖	74,420	—	—	1	—	—	—	1	—	1	—
E. District. St. George-in-the-East	45,795	—	—	—	—	1	—	—	—	1	—
E. District. Limehouse	57,376	1	—	5	—	3	—	2	1	2	—
E. District. Mile End Old Town	107,592	4	2	5	1	3	1	3	—	6	1
E. District. Poplar	166,748	13	1	9	2	8	—	13	4	16	7
S. District. St. Saviour, Southwark	27,177	1	—	—	—	2	—	—	1	1	—
S. District. St. George, Southwark	59,712	—	—	—	—	1	—	2	—	1	1
S. District. Newington	115,804	2	—	—	1	—	—	3	1	1	—
S. District. St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—
S. District. Bermondsey	84,682	1	—	—	—	1	—	—	—	—	—
S. District. Rotherhithe	39,255	1	—	2	—	1	—	—	—	—	—
S. District. Lambeth	275,203	3	2	4	2	1	—	3	—	3	—
S. District. Battersea	150,558	1	—	1	—	4	—	1	1	1	—
S. District. Wandsworth	156,942	—	—	5	—	2	1	2	—	1	—
S. District. Camberwell	235,344	3	1	6	1	3	—	—	—	5	—
S. District. Greenwich	165,413	1	1	1	—	1	—	2	2	1	—
S. District. Lewisham	92,647	—	—	3	—	—	—	—	—	—	—
S. District. Woolwich	48,848	—	—	—	1	—	—	1	—	—	—
S. District. Plumstead	88,539	1	—	—	1	1	—	3	—	1	—
S. District. Port of London	—	—	—	—	—	—	—	—	—	—	—

[a] Totals of actual *notifications*.
[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns a
of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population

ENTERIC FEVER—*continued.*

Weekly Statement, 3rd Quarter, 1893—*continued.*												Totals for 3rd Quarter, 1893.		Sanitary Areas.
Aug. 26.		Sept. 2.		Sept. 9.		Sept. 16.		Sept. 23.		Sept. 30.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
74	20	75	13	114	15	107	11	89	21	72	13	1,037	205	London.
73	—	*75*	—	*113*	—	*103*	—	*87*	—	*70*	—	*1,037*	—	(*Administrative County*).
1	—	—	—	3	—	1	—	—	—	—	—	14	2	Kensington.
2	—	1	—	2	—	—	1	3	—	2	1	20	3	Fulham.
2	—	2	—	3	2	—	—	1	—	1	—	20	4	Hammersmith.
—	—	1	—	2	1	1	—	3	2	2	—	15	6	Paddington.
1	1	1	1	1	—	4	—	4	1	—	2	19	5	Chelsea.
2	—	—	—	3	—	3	—	1	—	—	1	19	2	St. George, Hanover Sq.*
—	—	1	—	—	—	2	—	—	—	—	—	10	1	Westminster.
—	1	—	—	—	—	2	—	1	—	—	—	6	2	St. James, Westminster.
3	—	1	—	2	—	1	—	4	—	1	—	21	5	St. Marylebone.
—	—	—	1	—	—	—	—	—	—	1	—	11	1	Hampstead.
4	2	3	—	5	1	5	1	3	—	4	—	50	8	St. Pancras.
5	1	5	2	9	3	10	1	3	—	6	2	70	12	Islington.
5	2	9	2	19	—	14	1	14	3	11	—	124	16	Hackney.
—	—	1	1	2	—	—	1	—	—	1	—	8	3	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	1	St. Martin-in-the-Fields.
—	—	—	—	—	—	1	—	—	—	—	—	3	—	Strand.†
—	—	—	—	—	—	—	—	1	2	—	—	8	4	Holborn.‡
6	—	—	1	1	—	—	1	2	1	—	—	18	5	Clerkenwell.
—	—	—	1	1	—	1	—	1	1	1	1	10	8	St. Luke, Middlesex.
1	—	—	—	—	—	—	—	—	—	2	—	7	—	London, City of.§
5	2	4	—	4	—	9	—	2	2	4	—	52	9	Shoreditch.
2	1	1	—	3	—	4	—	3	1	2	—	36	8	Bethnal Green.
1	—	2	—	3	—	3	—	3	—	2	—	23	1	Whitechapel.‖
—	—	1	—	1	—	—	—	1	—	2	1	8	1	St. George-in-the-East
2	1	5	—	3	1	4	—	4	1	—	1	35	7	Limehouse.
8	1	5	—	4	1	2	—	3	2	1	—	53	11	Mile End Old Town.
3	1	10	—	16	1	19	—	10	2	10	1	141	25	Poplar.
—	—	1	—	—	—	1	—	—	—	—	—	8	1	St. Saviour, Southwark.
1	1	1	—	1	2	—	1	2	—	1	—	12	5	St. George, Southwark.
—	—	2	—	3	—	4	—	2	—	—	—	19	2	Newington.
—	—	—	—	—	—	—	—	—	—	1	—	1	—	St. Olave, Southwark.
2	—	—	—	4	1	1	—	—	1	1	—	11	3	Bermondsey.
—	—	1	—	—	—	1	—	1	1	—	—	7	2	Rotherhithe.
2	—	7	1	5	1	—	1	4	1	5	—	42	9	Lambeth.
3	1	1	—	1	—	—	—	1	—	4	1	20	4	Battersea.
1	—	1	—	1	1	1	—	3	—	1	—	25	4	Wandsworth.
4	4	3	1	4	—	3	1	2	—	1	—	39	8	Camberwell.
2	—	—	1	5	—	9	2	5	—	2	1	36	10	Greenwich.
4	1	—	—	—	—	—	—	—	—	1	1	11	4	Lewisham.
—	—	1	—	—	—	—	—	—	—	1	—	3	1	Woolwich.
1	—	—	1	1	—	1	—	2	—	1	—	15	2	Plumstead.
1	—	4	—	2	—	—	—	—	—	—	—	7	—	Port of London.

ling Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple (population, 21), and Furnival's Inn, (population, 121).
† Including Inner Temple (population, 96). ‖ Including Tower of London (population, 868).

Sanitary Areas.	Population (1881).	Zymotic Diseases—notified. Weekly Statement, 4th Quarter, 188										
		Oct. 7.		Oct. 14.		Oct. 21.		Oct. 28.		Nov. 4.		N
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.
London	[illegible]	[illegible]	9	80	23	109	26	74	27	109	17	1
(Administrative County)	[illegible]	[illegible]	—	91	—	107	—	78	—	60	—	[illegible]
W. District. Kensington	198,249	4	1	—	1	4	—	6	—	14	2	
W. District. Fulham	91,629	4	—	4	1	2	1	1	1	2	—	
W. District. Hammersmith	97,229	—	—	1	—	—	1	4	—	1	—	
W. District. Paddington	127,946	1	—	1	1	1	—	—	1	2	—	
W. District. Chelsea	96,220	2	—	2	—	2	2	2	1	1	—	
W. District. St. George, Hanover Sq.*	79,139	3	—	1	2	—	—	—	—	1	—	
W. District. Westminster	53,220	—	—	4	—	—	—	2	—	—	—	
W. District. St. James, Westminster	34,201	1	1	—	—	1	—	—	—	—	—	
N. District. St. Marylebone	146,464	2	—	3	1	3	—	1	—	2	1	
N. District. Hampstead	68,434	1	—	1	—	2	—	1	—	—	—	
N. District. St. Pancras	224,379	1	—	1	1	2	—	4	1	7	—	
N. District. Islington	319,145	4	—	8	2	6	—	5	2	10	—	
N. District. Hackney	259,542	11	2	12	4	9	1	9	3	7	1	1
Central District. St. Giles and St. George, Bloomsbury.	39,792	—	—	3	—	2	—	2	—	—	—	
Central District. St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	1	—	1	—	
Central District. Strand†	25,217	—	—	—	—	1	—	—	1	—	—	
Central District. Holborn‡	34,942	1	—	—	—	3	1	3	—	1	2	
Central District. Clerkenwell	66,210	—	—	2	—	3	1	—	—	3	1	
Central District. St. Luke, Middlesex	42,440	—	—	—	—	1	—	2	—	—	—	
Central District. London, City of§	37,282	1	—	1	—	2	—	—	—	3	—	
E. District. Shoreditch	124,769	3	—	4	—	2	—	—	—	3	—	
E. District. Bethnal Green	129,132	3	1	5	—	5	—	2	1	3	1	
E. District. Whitechapel	74,459	1	1	1	—	4	—	1	—	—	—	
E. District. St. George-in-the-East	45,795	4	—	—	—	1	—	—	—	—	—	
E. District. Limehouse	57,826	6	—	4	1	3	2	5	—	—	—	
E. District. Mile End Old Town	167,592	5	—	6	2	6	—	2	1	5	1	
E. District. Poplar	166,748	15	1	13	1	5	2	3	2	10	—	
S. District. St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—	1	—	
S. District. St. George, Southwark	59,712	—	—	3	—	1	—	1	1	—	—	
S. District. Newington	115,804	—	1	3	—	1	—	—	—	6	—	
S. District. St. Olave, Southwark	12,723	—	—	1	—	—	—	—	—	—	—	
S. District. Bermondsey	84,682	1	—	1	—	2	—	—	—	2	—	
S. District. Rotherhithe	39,255	—	—	—	—	—	—	—	—	—	—	
S. District. Lambeth	275,203	2	—	4	—	3	2	1	1	7	1	
S. District. Battersea	150,558	4	—	4	—	2	—	3	—	2	1	
S. District. Wandsworth	156,942	3	—	—	2	4	1	2	—	6	—	
S. District. Camberwell	235,344	3	—	—	—	5	1	4	1	3	2	
S. District. Greenwich	165,413	2	1	—	1	3	1	4	—	3	3	
S. District. Lewisham	92,647	3	—	1	1	—	—	—	—	—	—	
S. District. Woolwich	40,848	—	—	—	—	—	—	—	—	1	—	
S. District. Plumstead	88,539	2	—	1	—	2	—	1	—	2	—	
S. District. Port of London	—	—	—	—	—	—	—	—	—	—	—	

* Totals of actual *notifications*.

† Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of retur
of duplicate notifications.

‡ Including St. Peters, Westminster (population, 235). † Including Middle Temple (pop

ENTERIC FEVER—*continued.*

Weekly Statement, 4th Quarter, 1893—*continued.*

Nov. 25.		Dec. 2.		Dec. 9.		Dec. 16.		Dec. 23.		Dec. 30.		Totals for 4th Quarter, 1893.		Grand Totals for Year 1893.		Sanitary Areas.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
162	24	138	24	118	33	92	21	69	23	81	17	1,383	258	3,746	675	London.
153	—	*135*	—	*113*	—	*91*	—	*69*	—	*79*	—	*1,350*	—	*3,660*	—	*(Administrative County)*
5	1	5	—	3	1	2	1	3	—	2	1	60	13	103	17	Kensington.
2	1	—	—	—	3	—	—	—	—	—	—	21	9	61	17	Fulham.
2	—	—	1	—	—	1	—	5	1	3	3	22	7	68	15	Hammersmith.
4	2	10	2	1	2	—	—	1	2	5	—	29	10	70	21	Paddington.
1	—	6	1	2	1	—	—	1	—	1	1	25	6	79	17	Chelsea.
3	1	5	—	2	1	1	2	1	1	3	—	25	7	71	12	St. George, Hanover Sq.
1	—	4	2	—	—	1	—	—	1	1	—	18	3	45	7	Westminster.
4	—	—	—	1	—	—	1	—	—	1	—	12	3	22	6	St. James, Westminster.
12	1	7	—	3	1	3	—	1	2	3	1	48	9	99	20	St. Marylebone.
1	1	1	1	2	—	1	2	—	1	2	—	17	6	36	8	Hampstead.
9	1	6	2	8	1	8	—	5	—	1	1	67	10	184	27	St. Pancras.
11	2	6	1	12	2	12	1	7	4	4	2	105	18	270	47	Islington.
11	2	8	3	12	2	11	1	10	2	4	1	146	27	369	53	Hackney.
2	—	3	—	1	—	1	1	2	1	—	—	18	2	33	6	St. Giles and St. Geor Bloomsbury.
—	—	—	—	1	—	1	—	—	—	—	—	4	—	6	1	St. Martin-in-the-Fields.
2	—	—	—	—	—	1	—	—	—	—	—	5	1	12	1	Strand.†
3	2	2	—	1	1	2	—	—	—	1	—	20	7	41	13	Holborn.‡
—	1	—	—	3	—	1	1	—	—	2	—	24	4	71	10	Clerkenwell.
—	—	—	—	—	—	—	—	1	—	—	—	4	—	32	12	St. Luke, Middlesex.
1	—	—	—	1	—	2	—	—	—	2	—	14	—	28	—	London, City of.§
4	1	2	2	3	—	—	—	—	—	—	—	26	3	121	16	Shoreditch.
3	—	7	1	3	—	6	1	2	3	12	1	62	13	140	25	Bethnal Green.
5	1	1	—	—	1	—	—	—	1	1	1	20	5	65	8	Whitechapel.‖
7	—	1	—	1	—	1	—	—	—	1	1	24	1	47	4	St. George-in-the-East.
5	—	4	—	4	1	1	—	1	—	1	—	37	5	115	18	Limehouse.
7	1	4	—	3	1	1	—	2	—	2	1	53	9	151	29	Mile End Old Town.
11	1	16	1	11	3	10	2	5	—	7	—	121	13	396	62	Poplar.
3	—	—	—	1	—	1	—	—	—	1	—	8	—	21	3	St. Saviour, Southwark.
3	—	1	—	1	—	—	—	—	1	—	—	11	2	42	13	St. George, Southwark.
—	1	3	—	2	1	—	—	—	—	3	1	20	4	68	13	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	6	2	St. Olave, Southwark.
3	—	2	—	—	1	—	—	2	—	3	—	21	3	48	8	Bermondsey.
1	—	2	—	3	2	—	—	1	—	—	—	7	2	27	8	Rotherhithe.
5	—	8	1	1	2	4	2	2	—	2	—	41	10	160	36	Lambeth.
7	2	5	2	11	—	6	2	1	1	4	—	57	9	130	22	Battersea.
6	—	9	1	4	1	1	—	—	—	3	—	43	6	115	18	Wandsworth.
4	1	1	—	4	—	4	—	4	1	1	1	42	8	142	27	Camberwell.
10	—	3	2	7	3	6	1	6	—	2	—	56	13	118	28	Greenwich.
2	—	1	—	—	—	—	1	1	1	2	—	14	3	45	9	Lewisham.
1	—	1	—	3	1	1	1	5	—	1	—	13	2	29	5	Woolwich.
1	1	3	1	2	1	2	1	—	—	—	1	20	5	43	11	Plumstead.
—	—	1	—	1	—	—	—	—	—	—	—	2	—	17	—	Port of London.

‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 126), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 36). ‖ Including Tower of London (population, 903).

e 82300.

Sanitary Areas.		Population (1891).	Simple Continued Fever. Weekly Statement, 1st Quarter, 1893.									
			Jan. 7.		Jan. 14.		Jan. 21.		Jan. 28.		Feb. 4.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
London		4,232,118	[a]6	—	3	—	1	1	2	—	6	1
(*Administrative County*)		-	[b]6	—	3	—	2	—	2	—	6	—
W. District.	Kensington	166,308	—	—	—	—	—	—	—	—	1	—
	Fulham	91,632	—	—	—	—	—	—	—	—	—	—
	Hammersmith	97,239	—	—	—	—	—	—	—	—	—	—
	Paddington	117,846	1	—	—	—	—	—	—	—	—	—
	Chelsea	96,253	—	—	—	—	—	—	—	—	—	—
	St. George, Hanover Sq.*	78,599	—	—	—	—	—	1	—	—	—	—
	Westminster	55,539	—	—	—	—	—	—	—	—	—	—
	St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—	—
N. District.	St. Marylebone	142,404	—	—	—	—	—	—	—	—	1	1
	Hampstead	68,416	—	—	—	—	—	—	—	—	—	—
	St. Pancras	234,379	—	—	—	—	—	—	—	—	—	—
	Islington	319,143	—	—	—	—	—	—	—	—	—	—
	Hackney	229,542	—	—	—	—	—	—	—	—	1	—
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—
	Strand†	25,217	—	—	—	—	—	—	—	—	—	—
	Holborn‡	34,043	—	—	—	—	—	—	—	—	—	—
	Clerkenwell	66,216	—	—	—	—	—	1	—	—	—	—
	St. Luke, Middlesex	42,440	—	—	—	—	—	—	—	—	—	—
	London, City of§	37,583	—	—	—	—	—	—	—	—	—	—
E. District.	Shoreditch	124,069	—	—	—	—	—	—	—	—	—	—
	Bethnal Green	129,132	—	—	—	—	—	—	—	—	—	—
	Whitechapel‖	74,420	—	—	—	—	—	—	—	—	—	—
	St. George-in-the-East	45,795	—	—	—	—	—	—	—	—	—	—
	Limehouse	57,376	—	—	—	—	—	—	—	—	—	—
	Mile End Old Town	107,592	—	—	—	—	—	—	—	—	—	—
	Poplar	166,748	—	—	1	—	—	1	—	—	—	—
S. District.	St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—	—	—
	St. George, Southwark	59,712	—	—	—	—	—	—	—	—	—	—
	Newington	115,804	—	—	—	—	—	—	—	—	—	—
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—
	Bermondsey	84,682	—	—	—	—	—	—	—	—	—	—
	Rotherhithe	39,255	—	—	—	—	—	—	—	—	—	—
	Lambeth	275,203	—	—	1	—	1	—	—	—	3	—
	Battersea	150,558	5	—	1	—	—	—	—	—	—	—
	Wandsworth	156,942	—	—	—	—	—	—	—	—	—	—
	Camberwell	235,344	—	—	—	—	—	—	—	—	—	—
	Greenwich	165,413	—	—	—	—	—	—	—	—	—	—
	Lewisham	92,647	—	—	—	—	—	—	—	—	—	—
	Woolwich	40,818	—	—	—	—	—	—	—	—	—	—
	Plumstead	88,539	—	—	—	—	—	—	—	—	—	—
	Port of London	—	—	—	—	—	—	—	—	—	—	—

[a] Totals of actual *notifications*.
[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and de
of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population,

SIMPLE CONTINUED FEVER—*continued.*

Weekly Statement, 1st Quarter, 1893—*continued.*													Totals for 1st Quarter, 1893.		Sanitary Areas.
Feb. 25.		Mar. 4.		Mar. 11.		Mar. 18.		Mar. 25.		April 1.					
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.		Cases.	Deaths.	
6	—	4	—	—	—	3	—	2	—	1	1		38	3	London.
5	—	4	—	—	—	*3*	—	*2*	—	*1*	—		*38*	—	(*Administrative County.*)
—	—	—	—	—	—	—	—	—	—	—	—		1	—	Kensington.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Fulham.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Hammersmith.
—	—	—	—	—	—	—	—	—	—	—	—		1	—	Paddington.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Chelsea.
—	—	—	—	—	—	—	—	—	—	—	—		—	1	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Westminster.
1	—	—	—	—	—	—	—	—	—	—	1		1	1	St. James, Westminster.
—	—	—	—	—	—	—	—	—	—	—	—		1	1	St. Marylebone.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Hampstead.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. Pancras.
2	—	1	—	—	—	—	—	—	—	—	—		3	—	Islington.
—	—	—	—	—	—	—	—	—	—	—	—		1	—	Hackney.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Strand.†
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Holborn.‡
—	—	—	—	—	—	—	—	—	—	—	—		3	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	London, City of.§
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Shoreditch.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Bethnal Green.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Whitechapel.‖
—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. George-in-the-East.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Limehouse.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Mile End Old Town.
2	—	—	—	—	—	2	—	—	—	—	—		7	—	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. Saviour, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. George, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Newington.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. Olave, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Bermondsey.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Rotherhithe.
1	—	2	—	—	—	1	—	1	—	1	—		11	—	Lambeth.
—	—	—	—	—	—	—	—	—	—	—	—		6	—	Battersea.
—	—	—	—	—	—	—	—	—	—	—	—		1	—	Wandsworth.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Camberwell.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Greenwich.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Lewisham.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Woolwich.
—	—	1	—	—	—	—	—	1	—	—	—		2	—	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—		—	—	Port of London.

luding Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple nn (population, 21), and Furnival's Inn (population, 121).
§ Including Inner Temple (population, 98). ‖ Including Tower of London (population, 269).

Sanitary Areas.	Population (1891).	Simple Continued Fever—continued. Weekly Statement, 2nd Quarter, 1893.									
		April 8.		April 15.		April 22.		April 29.		May 6.	
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
London	4,232,118	[a]1	1	—	—	1	—	—	1	4	—
(*Administrative County*)	—	[b]1	—	—	—	1	—	—	—	4	—
W. District. Kensington	166,308	—	—	—	—	—	—	—	—	—	—
W. District. Fulham	91,639	—	—	—	—	—	—	—	—	—	—
W. District. Hammersmith	97,239	—	—	—	—	—	—	—	—	—	—
W. District. Paddington	117,846	—	—	—	—	—	—	—	—	—	—
W. District. Chelsea	96,253	—	—	—	—	—	—	—	1	—	—
W. District. St. George, Hanover Sq.*	78,599	—	—	—	—	—	—	—	—	—	—
W. District. Westminster	55,539	—	—	—	—	—	—	—	—	—	—
W. District. St. James, Westminster	24,995	1	—	—	—	—	—	—	—	—	—
N. District. St. Marylebone	142,404	—	—	—	—	1	—	—	—	—	—
N. District. Hampstead	68,416	—	—	—	—	—	—	—	—	1	—
N. District. St. Pancras	234,379	—	—	—	—	—	—	—	—	—	—
N. District. Islington	319,143	—	1	—	—	—	—	—	—	—	—
N. District. Hackney	220,542	—	—	—	—	—	—	—	—	1	—
E. District. St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—
E. District. St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—
E. District. Strand†	25,217	—	—	—	—	—	—	—	—	—	—
E. District. Holborn‡	34,043	—	—	—	—	—	—	—	—	—	—
E. District. Clerkenwell	66,216	—	—	—	—	—	—	—	—	—	—
E. District. St. Luke, Middlesex	42,440	—	—	—	—	—	—	—	—	—	—
E. District. London, City of§	37,583	—	—	—	—	—	—	—	—	—	—
E. District. Shoreditch	124,009	—	—	—	—	—	—	—	—	—	—
E. District. Bethnal Green	129,132	—	—	—	—	—	—	—	—	—	—
E. District. Whitechapel‖	74,420	—	—	—	—	—	—	—	—	—	—
E. District. St. George-in-the-East	45,795	—	—	—	—	—	—	—	—	—	—
E. District. Limehouse	57,376	—	—	—	—	—	—	—	—	—	—
E. District. Mile End Old Town	107,592	—	—	—	—	—	—	—	—	—	—
E. District. Poplar	166,748	—	—	—	—	—	—	—	—	—	—
S. District. St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—	—	—
S. District. St. George, Southwark	59,712	—	—	—	—	—	—	—	—	1	—
S. District. Newington	115,804	—	—	—	—	—	—	—	—	—	—
S. District. St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—
S. District. Bermondsey	84,682	—	—	—	—	—	—	—	—	—	—
S. District. Rotherhithe	39,255	—	—	—	—	—	—	—	—	—	—
S. District. Lambeth	275,203	—	—	—	—	—	—	—	—	—	—
S. District. Battersea	150,558	—	—	—	—	—	—	—	—	—	—
S. District. Wandsworth	156,942	—	—	—	—	—	—	—	—	—	—
S. District. Camberwell	235,344	—	—	—	—	—	—	—	—	1	—
S. District. Greenwich	165,413	—	—	—	—	—	—	—	—	—	—
S. District. Lewisham	92,647	—	—	—	—	—	—	—	—	—	—
S. District. Woolwich	40,848	—	—	—	—	—	—	—	—	—	—
S. District. Plumstead	88,539	—	—	—	—	—	—	—	—	—	—
S. District. Port of London	—	—	—	—	—	—	—	—	—	—	—

[a] Totals of actual *notifications*.
[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and
of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (populatio

SIMPLE CONTINUED FEVER—*continued.*

Weekly Statement, 2nd Quarter, 1893—*continued.*														Totals for 2nd Quarter, 1893.		Sanitary Areas.
May 20.		May 27.		June 3.		June 10.		June 17.		June 24.		July 1.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
5	—	5	—	3	—	4	—	2	1	8	—	10	1	45	4	London.
4	—	5	—	2	—	4	—	2	—	8	—	10	—	43	—	(*Administrative County.*)
—	—	2	—	1	—	—	—	—	—	—	—	—	—	3	—	Kensington.
3	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	Fulham.
—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	Hammersmith.
—	—	—	—	—	—	—	—	1	—	1	—	—	—	2	—	Paddington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	Chelsea.
—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. James, Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. Marylebone.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Hampstead.
—	—	—	—	1	—	—	—	—	—	1	—	—	—	2	—	St. Pancras.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	1	Islington
—	—	—	—	—	—	1	—	—	—	—	—	1	1	3	1	Hackney.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Strand.†
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Holborn.‡
—	—	—	—	—	—	—	—	—	—	—	—	2	—	2	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	London, City of.§
—	—	—	—	—	—	1	—	—	—	—	—	1	—	2	—	Shoreditch
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Bethnal Green.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Whitechapel.‖
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George-in-the-East.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Limehouse.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Mile End Old Town.
—	—	—	—	1	—	—	—	—	—	—	—	1	—	2	—	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Saviour, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. George, Southwark.
—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Bermondsey.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Rotherhithe.
—	—	2	—	—	—	1	—	—	—	4	—	4	—	12	—	Lambeth.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Battersea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Wandsworth.
1	—	—	—	—	—	—	—	—	—	2	—	—	—	4	—	Camberwell.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Greenwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lewisham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Woolwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Port of London.

Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96). ‖ Including Tower of London (population, 868).

Sanitary Areas.		Population (1891.)	Simple Continued Fever—cont. Weekly Statement, 3rd Quarter,							
			July 8.		July 15.		July 22.		July 29.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
London		4,232,118	3	—	6	1	4	—	3	1
(*Administrative County*)		—	3	—	6	—	4	—	3	—
W. District.	Kensington	166,308	—	—	—	—	—	—	—	—
	Fulham	91,639	—	—	—	—	—	—	—	—
	Hammersmith	97,239	—	—	—	—	—	—	—	—
	Paddington	117,846	—	—	—	—	1	—	—	—
	Chelsea	96,253	—	—	—	—	—	—	—	—
	St. George, Hanover Sq.*	78,590	1	—	—	1	—	—	—	—
	Westminster	55,539	—	—	—	—	—	—	—	—
	St. James, Westminster	24,995	—	—	—	—	—	—	—	—
N. District.	St. Marylebone	142,404	—	—	—	—	—	—	—	—
	Hampstead	68,416	—	—	—	—	—	—	—	—
	St. Pancras	234,379	—	—	—	—	—	—	—	—
	Islington	319,143	—	—	—	—	—	—	—	—
	Hackney	229,542	—	—	—	—	—	—	—	—
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—
	Strand†	25,217	—	—	—	—	—	—	—	—
	Holborn‡	34,043	—	—	—	—	—	—	—	—
	Clerkenwell	66,216	—	—	—	—	—	—	1	—
	St. Luke, Middlesex	42,440	—	—	—	—	—	—	—	—
	London, City of§	37,583	—	—	—	—	—	—	—	—
E. District.	Shoreditch	124,009	—	—	—	—	—	—	—	—
	Bethnal Green	129,132	—	—	—	—	—	—	—	1
	Whitechapel‖	74,420	—	—	—	—	—	—	—	—
	St. George-in-the-East	45,795	—	—	—	—	—	—	—	—
	Limehouse	57,376	—	—	—	—	—	—	—	—
	Mile End Old Town	107,592	—	—	—	—	—	—	—	—
	Poplar	166,748	—	—	3	—	—	—	1	—
S. District.	St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—
	St. George, Southwark	59,712	—	—	—	—	—	—	—	—
	Newington	115,804	—	—	—	—	—	—	—	—
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—
	Bermondsey	84,682	—	—	—	—	—	—	—	—
	Rotherhithe	39,255	—	—	—	—	—	—	—	—
	Lambeth	275,203	1	—	2	—	3	—	1	—
	Battersea	150,558	—	—	—	—	—	—	—	—
	Wandsworth	156,942	1	—	1	—	—	—	—	—
	Camberwell	235,344	—	—	—	—	—	—	—	—
	Greenwich	165,413	—	—	—	—	—	—	—	—
	Lewisham	92,647	—	—	—	—	—	—	—	—
	Woolwich	40,848	—	—	—	—	—	—	—	—
	Plumstead	88,539	—	—	—	—	—	—	—	—
	Port of London	—	—	—	—	—	—	—	—	—

* Totals of actual *notifications*.
† Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of retu
of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (p

SIMPLE CONTINUED FEVER—*continued.*

Weekly Statement, 3rd Quarter, 1893—*continued.*

Aug. 19.		Aug. 26.		Sept. 2.		Sept. 9.		Sept. 16.		Sept. 23.		Sept. 30.		Totals for 3rd Quarter, 1893.		Sanitary Areas.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
8	1	3	—	5	—	1	—	5	—	4	1	6	—	57	7	London.
8	—	3	—	4	—	1	—	5	—	4	—	4	—	52	—	(*Administrative County.*)
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Kensington.
—	—	—	—	1	—	—	—	1	—	—	—	—	—	2	—	Fulham.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Hammersmith.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	Paddington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Chelsea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Westminster.
—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	St. James, Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Marylebone.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Hampstead.
—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	St. Pancras.
—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	Islington.
—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	Hackney.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Strand.†
—	—	—	—	—	—	—	—	—	—	—	—	2	—	2	—	Holborn.‡
—	—	—	—	1	—	—	—	—	—	—	—	—	—	2	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	London, City of.§
—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	1	Shoreditch.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	Bethnal Green.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Whitechapel.‖
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George-in-the-East.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Limehouse.
—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	Mile End Old Town.
3	—	—	—	1	—	—	—	—	—	—	—	2	—	12	—	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Saviour, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Bermondsey.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Rotherhithe.
1	1	2	—	1	—	—	—	2	—	3	1	2	—	22	3	Lambeth.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Battersea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	Wandsworth.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Camberwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Greenwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lewisham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Woolwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Port of London.

‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96). ‖ Including Tower of London (population, 868).

Sanitary Areas.		Population (1891).	Simple Continued Fever—*continued.* Weekly Statement, 4th Quarter, 1893.											
			Oct. 7.		Oct. 14.		Oct. 21.		Oct. 28.		Nov. 4.		Nov. 11	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	
London		4,232,118	[a]7	—	8	—	6	1	6	1	4	1	7	
(*Administrative County*)			[b]7	—	7	—	4	—	6	—	4	—	7	
W. District.	Kensington	166,308	—	—	—	—	—	—	—	—	1	—	1	
	Fulham	91,639	—	—	—	—	—	—	—	—	—	—	—	
	Hammersmith	97,239	—	—	—	—	—	—	—	—	—	—	—	
	Paddington	117,846	—	—	—	—	—	—	—	—	—	—	—	
	Chelsea	96,253	—	—	1	—	—	1	—	—	—	—	—	
	St. George, Hanover Sq.*	78,599	—	—	—	—	—	—	—	—	—	—	—	
	Westminster	55,539	—	—	—	—	—	—	—	—	—	—	—	
	St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—	—	—	
N. District.	St. Marylebone	142,404	—	—	—	—	—	—	—	—	1	—	—	
	Hampstead	68,416	—	—	1	—	—	—	—	—	—	—	—	
	St. Pancras	234,379	—	—	—	—	—	—	—	—	—	—	—	
	Islington	319,143	—	—	—	—	1	—	—	—	—	—	—	
	Hackney	220,542	—	—	—	—	—	—	—	—	—	—	—	
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—	—	
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—	—	
	Strand†	25,217	—	—	—	—	—	—	—	—	—	—	—	
	Holborn‡	34,043	—	—	—	—	—	—	—	—	—	—	—	
	Clerkenwell	66,216	—	—	—	—	—	—	—	—	—	—	1	
	St. Luke, Middlesex	42,440	—	—	—	—	—	—	—	—	—	—	—	
	London, City of§	37,583	—	—	—	—	—	—	—	—	—	—	—	
E. District.	Shoreditch	124,009	—	—	—	—	—	—	—	—	—	—	—	
	Bethnal Green	129,132	—	—	—	—	1	—	—	—	—	—	—	
	Whitechapel‖	74,420	—	—	—	—	—	—	—	—	—	—	—	
	St. George-in-the-East	45,795	—	—	—	—	—	—	—	—	—	—	1	
	Limehouse	57,376	—	—	—	—	—	—	—	—	—	—	—	
	Mile End Old Town	107,592	—	—	—	—	—	—	—	—	—	—	—	
	Poplar	166,748	4	—	3	—	2	—	1	—	1	—	1	
S. District.	St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—	—	—	—	
	St. George, Southwark	59,712	—	—	—	—	—	—	1	—	—	—	—	
	Newington	115,804	—	—	—	—	—	—	—	—	—	—	—	
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—	—	
	Bermondsey	84,682	—	—	—	—	—	—	—	—	—	—	—	
	Rotherhithe	39,255	—	—	—	—	—	—	1	—	—	—	—	
	Lambeth	275,263	2	—	—	—	2	—	3	1	—	—	2	
	Battersea	150,558	—	—	—	—	—	—	—	—	—	—	1	
	Wandsworth	156,942	—	—	1	—	—	—	—	—	—	—	—	
	Camberwell	235,344	1	—	—	—	—	—	—	—	—	—	—	
	Greenwich	165,413	—	—	1	—	—	—	—	—	—	—	—	
	Lewisham	92,647	—	—	—	—	—	—	—	—	—	1	—	
	Woolwich	40,848	—	—	—	—	—	—	—	—	1	—	—	1
	Plumstead	88,539	—	—	1	—	—	—	—	—	—	—	—	
	Port of London	—	—	—	—	—	—	—	—	—	—	—	—	

[a] Totals of actual *notifications.*
[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and of duplicate notifications.
* Including St. Peters, Westminster (population, 235). † Including Middle Temple (populati

SIMPLE CONTINUED FEVER—*continued.*

Weekly Statement, 4th Quarter, 1893—*continued.*											Totals for 4th Quarter, 1893.		Grand Totals for Year 1893.		Sanitary Areas.
Dec. 2.		Dec. 9.		Dec. 16.		Dec. 23.		Dec. 30.							
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.		Cases.	Deaths.	Cases.	Deaths.	
8	—	4	1	12	—	3	—	3	1		77	7	217	21	London.
8	—	4	—	*12*	—	*3*	—	*3*	—		*73*	—	*206*	—	(*Administrative County.*)
1	—	—	—	1	—	1	—	—	—		7	—	11	—	Kensington.
—	—	—	—	—	—	—	—	—	—		1	—	6	—	Fulham.
—	—	—	1	2	—	—	—	—	1		2	2	4	2	Hammersmith.
—	—	—	—	—	—	—	—	—	—		1	—	6	—	Paddington.
—	—	—	—	—	—	—	—	—	—		1	1	1	2	Chelsea.
—	—	—	—	—	—	—	—	—	—		—	—	2	2	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	—		—	—	—	1	Westminster.
—	—	—	—	—	—	—	—	—	—		—	—	3	1	St. James, Westminster.
—	—	—	—	—	—	—	—	—	—		1	—	3	1	St. Marylebone.
—	—	—	—	—	—	1	—	—	—		2	—	3	—	Hampstead.
—	—	—	—	—	—	—	—	—	—		—	—	3	—	St. Pancras.
—	—	1	—	—	—	—	—	—	—		3	—	8	1	Islington.
1	—	—	—	1	—	—	—	—	—		2	—	7	1	Hackney.
—	—	—	—	—	—	—	—	—	—		—	—	—	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—		—	—	—	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—		—	—	—	—	Strand.†
—	—	—	—	—	—	—	—	—	—		—	—	2	—	Holborn.‡
—	—	—	—	—	—	—	—	—	—		1	—	8	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—		—	—	1	—	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—		—	—	1	1	London, City of.§
—	—	—	—	1	—	—	—	—	—		1	—	4	1	Shoreditch.
—	—	—	—	—	—	—	—	—	—		2	—	4	—	Bethnal Green.
—	—	—	—	—	—	—	—	—	—		—	—	—	—	Whitechapel.‖
—	—	—	—	—	—	—	—	—	—		1	—	1	—	St. George-in-the-East.
—	—	—	—	1	—	—	—	—	—		1	—	1	—	Limehouse.
—	—	—	—	—	—	—	—	—	—		—	—	1	—	Mile End Old Town.
2	—	—	—	1	—	—	—	1	—		16	—	37	—	Poplar.
—	—	—	—	—	—	—	—	—	—		—	—	—	—	St. Saviour, Southwark.
—	—	—	—	—	—	—	—	—	—		1	—	2	—	St. George, Southwark.
—	—	—	—	—	—	—	—	—	—		—	—	1	—	Newington.
—	—	—	—	—	—	—	—	—	—		—	—	—	—	St. Olave, Southwark.
—	—	—	—	—	—	—	—	—	—		—	—	1	—	Bermondsey.
1	—	—	—	—	—	—	—	1	—		3	—	3	—	Rotherhithe.
3	—	3	—	—	—	—	—	1	—		18	1	63	4	Lambeth.
—	—	—	—	1	—	—	—	—	—		2	—	9	—	Battersea.
—	—	—	—	1	—	—	—	—	—		3	—	6	1	Wandsworth.
—	—	—	—	—	—	—	—	—	—		1	—	5	—	Camberwell.
—	—	—	—	2	—	1	—	—	—		4	1	5	1	Greenwich.
—	—	—	—	—	—	—	—	—	—		—	1	—	1	Lewisham.
—	—	—	—	1	—	—	—	—	—		2	1	2	1	Woolwich.
—	—	—	—	—	—	—	—	—	—		1	—	3	—	Plumstead.
—	—	—	—	—	—	—	—	—	—		—	—	—	—	Port of London.

lling Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple
ulation, 21), and Furnival's Inn (population, 121).
ncluding Inner Temple (population, 96). ‖ Including Tower of London (population, 868).

Sanitary Areas.	Population (1891).	Typhus Fever. Weekly Statement, 1893. Jan. 28. Cases.	Feb. 18. Cases.	Mar. 11. Cases.	Mar. 18. Cases.	April 1. Cases.	Totals for 1st Quarter, 1893. Cases.	Deaths.	April 15. Cases.	May 6. Cases.	May 13. Cases.	Deaths.	May 20. Cases.	May 27. Cases.	Deaths.
London	4,232,118	*1	1	1	1	—	4	—	2	1	1	1	—	2	2
(*Administrative County*)	—	b1	1	1	1	1	5	—	1	1	1	—	1	2	—
W. District. Kensington	166,308	—	—	—	—	—	—	—	—	—	—	—	—	1	1
W. District. Fulham	91,639	—	—	1	—	—	1	—	—	—	—	—	—	—	—
W. District. Hammersmith	97,239	—	—	—	—	—	—	—	—	—	—	—	—	—	—
W. District. Paddington	117,846	—	—	—	—	—	—	—	2	—	—	—	—	—	—
W. District. Chelsea	96,233	—	—	—	—	—	—	—	—	—	—	—	—	—	—
W. District. St. George, Hanover Sq.*	78,599	—	—	—	—	—	—	—	—	—	—	—	—	—	—
W. District. Westminster	55,539	—	—	—	—	—	—	—	—	—	—	—	—	—	—
W. District. St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—	—	—	—	—	—
N. District. St. Marylebone	142,404	1	—	—	—	—	1	—	—	1	—	—	—	—	—
N. District. Hampstead	68,416	—	—	—	—	—	—	—	—	—	—	—	—	—	—
N. District. St. Pancras	234,379	—	—	—	—	—	—	—	—	—	—	—	—	—	—
N. District. Islington	319,143	—	—	—	—	—	—	—	—	—	—	—	—	—	—
N. District. Hackney	229,542	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Central District. St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Central District. St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Central District. Strand†	25,217	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Central District. Holborn‡	34,043	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Central District. Clerkenwell	66,216	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Central District. St. Luke, Middlesex	42,440	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Central District. London, City of§	37,583	—	—	—	—	—	—	—	—	—	—	—	—	—	—
E. District. Shoreditch	124,009	—	—	—	—	—	—	—	—	—	—	—	—	—	—
E. District. Bethnal Green	129,132	—	—	—	—	—	—	—	—	—	—	—	—	—	—
E. District. Whitechapel‖	74,426	—	—	—	—	—	—	—	—	—	—	—	—	—	—
E. District. St. George-in-the-East	45,795	—	—	—	—	—	—	—	—	—	—	—	—	—	—
E. District. Limehouse	57,376	—	—	—	—	—	—	—	—	—	—	—	—	—	1
E. District. Mile End Old Town	107,592	—	—	—	1	—	1	—	—	—	—	—	—	—	—
E. District. Poplar	166,748	—	—	—	—	—	—	—	—	—	—	—	—	1	1
S. District. St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—	—	—	—	—	—	—
S. District. St. George, Southwark	59,712	—	—	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Newington	115,804	—	—	—	—	—	—	—	—	—	—	—	—	—	—
S. District. St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Bermondsey	84,682	—	—	—	—	—	—	—	—	1	1	—	—	—	—
S. District. Rotherhithe	39,255	—	—	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Lambeth	275,203	—	—	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Battersea	150,558	—	1	—	—	—	1	—	—	—	—	—	—	—	—
S. District. Wandsworth	156,942	—	—	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Camberwell	235,344	—	—	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Greenwich	165,413	—	—	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Lewisham	92,647	—	—	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Woolwich	40,848	—	—	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Plumstead	88,539	—	—	—	—	—	—	—	—	—	—	—	—	—	—
S. District. Port of London	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

* Totals of actual *notifications.*
b Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and duplicate notifications.
§ Including St. Peters, Westminster (population, 235). † Including Middle Temple (populat

TYPHUS FEVER—*continued.*

Totals for 2nd Quarter, 1893.		Weekly Statement, 1893—*continued.*																Grand Totals for Year, 1893.		Sanitary Areas.
		July 15.	July 29.	Aug. 12.	Sept. 23.	Totals for 3rd Quarter, 1893.		Oct. 14.	Nov. 11.	Nov. 18.	Nov. 25.		Dec. 2.	Dec. 16.	Totals for 4th Quarter, 1893.					
Cases.	Deaths.	Cases.	Cases.	Cases.	Cases.	Cases.	Deaths.	Cases.	Cases.	Cases.	Cases.	Deaths.	Cases.	Cases.	Cases.	Deaths.		Cases.	Deaths.	
8	4	1	1	3	3	8	—	1	1	1	1	1	1	—	5	1		25	5	London.
8	—	*1*	*1*	*3*	*3*	*8*	—	*1*	*1*	*1*	—	—	*1*	*1*	*3*	—		*26*	—	(*Administrative County*).
1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		1	—	Kensington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		1	—	Fulham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Hammersmith.
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		2	—	Paddington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Chelsea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. James, Westminster.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		2	—	St. Marylebone.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Hampstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. Pancras.
—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	1	1		1	1	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Hackney.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Strand.†
—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—		1	—	Holborn.‡
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. Luke, Middlesex.
—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—		1	—	London, City of.§
—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—		1	—	Shoreditch.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Bethnal Green.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		1	—	Whitechapel.‖
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. George-in-the-East.
—	1	1	—	—	2	3	—	—	—	—	—	—	—	—	—	—		3	1	Limehouse.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		1	—	Mile End Old Town.
1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		1	1	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. Saviour, Southwark.
—	—	—	1	—	—	1	—	—	—	1	—	—	—	—	1	—		2	—	St. George, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	St. Olave, Southwark.
1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		1	1	Bermondsey.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Rotherhithe.
1	1	—	—	2	—	2	—	—	—	—	—	—	—	—	—	—		3	1	Lambeth.
—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	2	—		3	—	Battersea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Wandsworth.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Camberwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Greenwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Lewisham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Woolwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	Port of London.

‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

† Including Inner Temple (population, 93). ‖ Including Tower of London (population, 868).

No. 13.

App. A. No. 13.

On the Causes of Lead Poisoning; by Mr. Power.

Interim Report on Inquiry by the Board's Medical De respecting the Causes of the Lead Poisoning which referred to Public Water Supplies derived from M Sources; by Mr. W. H. Power, F.R.S.

This investigation was entrusted to the Medical Depa September 1890. As was foreseen, it has proved both co tedious. And it is not yet completed. Nevertheless at the st inquiry now reached, a brief statement of the methods of in adopted and of the facts so far collected may be of advantage. it is proposed to report further, and in detail, on the subject.

To the date when this inquiry was ordered, the cause or dangerous action on lead of natural waters had hardly been rega volving other than purely chemical problems. And upon this v moorland waters known to act vigorously upon lead had been to examination; with the result that their possession of this pro referred, now to the presence, now to the absence, in them of another chemical substance. In this way, at one time the p a water supply of undue amount of free oxygen, or of free another time deficiency in the water of lime or of silica, was pu as sufficiently accounting for lead poisoning among the inhabi district; and upon such bases of observation, now one, now *corrective* of the lead-dissolving power of moorland water was adoption by water authorities. But so far, in regard at an moorland waters, scarcely any attempt had, except by Dr. White at Sheffield, been made at study of cause of their lead- property, in the sense of seeking to identify the primary a conditions without which the effect would not result. In thes stances it was determined that, as a matter of first instance, th Department should undertake systematic study *in situ*, so to their gathering grounds, of the natural history of moorland wa a view to learning the conditions under which these waters *acq power* of dissolving lead. And, indeed, it was seen that upon k of this class might rest the decision whether or not an elab dubious process is to be applied to one or another water, in or it for domestic use under the customary conditions of a commu

Accordingly a scheme of procedure comprising several separ or stages, was formulated as follows:—

I. Inquiry over a wide but defined area wherein public water are largely derived from moorland gathering grounds, r the physical circumstances and conditions of delivery public water service, and as to whether or not lead-p had been observed in connexion therewith.

II. Differential examination, week by week throughout the water samples freshly collected from each of several p determined, and distinct, sources *on one and the same gathering ground*. The gathering ground selected to a region known to afford waters which, from time to time their aggregate, manifested pronounced ability to dissol The differential examination of the several weekly sa include note of the direction, and the limits, of diversity chemical and bacterial constituents; as well as of varia the ability of these samples to dissolve lead, with obs also as to how far this property was parallel with varia their chemical and bacterial features, or with changes environment of seasonal or of meteorological sort.

III. Observation and testing under diverse conditions, seasonal and meteorological, of the waters from a great variety of moorland gathering grounds within the area scheduled for inquiry, with a view to ascertaining in what way and in what degree each such water supply, or part of it, differed as regards telluric and surface conditions, in reference to chemical and bacterial constituents, and in regard of ability to dissolve lead, from the standard or standards obtained as a result of research under heading No. II.

I.—Preliminary Inquiry in a Selected Area as to the Circumstances of Public Water Supplies in Reference to Lead Poisoning ascribed thereto.

The object of inquiry in the above sense was twofold: to ascertain from local sources of information within a wide area where lead poisoning was heard of, the amount of it that was being observed; and incidentally to obtain, broadly and generally, indication of the way or ways in which moorland supplies that were causing lead poisoning differed from those wherewith lead poisoning was not being associated. A series therefore of questions (Addendum A.), framed with a view of eliciting information on a variety of matters in the above connexion, was addressed to the Medical Officer of Health of every Sanitary District comprised within certain counties; the replies as they came to hand were next carefully studied and tabulated, and the results of analysis of the facts for each county duly summarised. Records of the data thus obtained, for the West Riding of Yorkshire by Dr. Barry, for Lancashire, Cumberland, and Westmorland by Mr. T. W. Thompson, are annexed as Addenda B. and C. to this report. Briefly the chief facts ascertained by them are as follow :—

West Riding of Yorkshire.—Area, 1,861,699 acres; number of inhabitants (estimated 1890) - -	2,536,766
Population obtaining public water service - -	2,086,187
Population obtaining public water service in the main from moorland sources - - - -	1,806,403
Population obtaining by public service, in the main from moorland sources, water *filtered* before delivery to consumers - - - -	692,326
Population obtaining by public service, in the main from moorland sources, water *not filtered* before delivery to consumers - - - - - -	1,114,077
Population obtaining by public service moorland water to which (or to portions of which) multiple cases of lead poisoning had in recent years been referred - -	711,202
Population obtaining *filtered* moorland water to which multiple cases of lead poisoning had in recent years been referred - - - - - -	34,061
Population obtaining *unfiltered* moorland water to which multiple cases of lead poisoning had in recent years been referred - - - -	677,141
Lancashire.—Area, 1,203,708 acres; number of inhabitants (estimated 1890–91) - - - -	4,020,328
Population obtaining public water service - -	3,756,539
Population obtaining public water service in the main from moorland sources - - - -	3,408,447
Population obtaining by public service, in the main from moorland sources, water *filtered* before delivery to consumers - - - -	1,203,713

Population obtaining by public service, in the main from moorland sources, water *not filtered* before delivery to consumers - - - - - -
Population obtaining by public service moorland water to which (or to portions of which) multiple cases of lead poisoning had in recent years been referred - -
Population obtaining *filtered* moorland water to which multiple cases of lead poisoning had in recent years been referred - - - - - -
Population obtaining *unfiltered* moorland water to which multiple cases of lead poisoning had in recent years been referred - - - - -

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CUMBERLAND.—Area, 970,154 acres; number of inhabitants (estimated 1890–91) - - -
Population obtaining public water service - -
Population obtaining public water service in the main from moorland sources - - - -
Population obtaining by public service, in the main from moorland sources, water *filtered* before delivery to consumers - - - - -
Population obtaining by public service, in the main from moorland sources, water *not filtered* before delivery to consumers - - - - -
Population obtaining by public service moorland water to which (or to portions of which) multiple cases of lead poisoning had in recent years been referred - -
Population obtaining *filtered* moorland water to which multiple cases of lead poisoning had in recent years been referred - - - - - -
Population obtaining *unfiltered* moorland water to which multiple cases of lead poisoning had in recent years been referred - - - -

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WESTMORLAND.—Area, 503,073 acres; number of inhabitants (estimated 1890–91) - - - -
Population obtaining public water service - -
Population obtaining water service in the main from moorland sources - - - - -
Population obtaining by public service, in the main from moorland sources, water *filtered* before delivery to consumers - - - - -
Population obtaining by public service, in the main from moorland sources, water *not filtered* before delivery to consumers - - - - - -
Population obtaining by public service moorland water to which (or to portions of which) multiple cases of lead poisoning had in recent years been referred - -
Population obtaining *filtered* moorland water to which multiple cases of lead poisoning had in recent years been referred - - - - - -
Population obtaining *unfiltered* moorland water to which multiple cases of lead poisoning had in recent years been referred - - - -

It thus appeared, that of a population in these counties amo
over six millions, some 70–80 per cent. were obtaining their
water by public service derived in the main from moorland

that nearly two-thirds (64 per cent.) of the population thus supplied were having their moorland water delivered to them in unfiltered condition; and, that so far as lead poisoning by public water-supplies was being recognised in the counties in question, it was almost wholly confined to districts obtaining unfiltered moorland water. At the same time, it appeared that the amount of lead poisoning ascertained to be occurring differed widely in the several counties. Among West Riding districts lead poisoning referred to moorland water was abundantly recognised; in districts of Lancashire it was hardly heard of; while from Cumberland and Westmorland none was reported. How far this contrast in the amount of observed lead poisoning in the several counties was to be thought of as referable to intrinsic differences in moorland water as such, to precautionary measures public or private that had been taken, or to want of recognition of lead poisoning that was tending to occur, could not be judged of from the data supplied: so that it was seen that in these aspects the subject would require further study, which has accordingly been undertaken. As to this, it may be noted, at this stage, that want of recognition of lead poisoning has perhaps had not unimportant influence on the favourable report rendered of certain water supplies by the local officers; at any rate, the inhabitants of particular districts reported to the Department as altogether free from lead poisoning notwithstanding that they were served with unfiltered moorland water, have since been found suffering from the malady in question.

II.—Differential Examination, at Weekly Intervals and over a prolonged Period, of Waters of diverse sort from one and the same Moorland Gathering Ground.

This section of the inquiry was, as has been already indicated, concerned in submitting severally to frequent comparative test, those waters which, when combined together at a distance from their common moorland gathering ground, are apt to constitute public water supply; the object being to determine what are the seasonal modifications, chemical and bacterial, of each of such contributory waters; in what way and to what degree they differ at one and another time from each other as regards their inorganic and organic constituents; and how far diversity of their ability to dissolve lead is associated with season of the year and is at the same time parallel to observed differences in their chemical and bacterial characters. In this connexion two sorts of water common in moorland regions, namely, water issuing from springs in the soil, and rainfall-water accumulating on, or flowing over, or through, the peat substance, were seen to especially call for study; as also these two sorts of water in combination, and under circumstances, therefore, permitting interreaction of their several constituents; such water, for instance, as is afforded by a main stream, into which are received the contributory waters of a given moorland gathering ground.

For the purpose of establishing standards in the above sense of the behaviour of moorland waters, it appeared necessary that a laboratory should be acquired in the vicinity of the moorland gathering ground to be studied, so that the interval of time between the collection of weekly water samples and the testing of them in one and another way might be reduced within the smallest practicable limit. Hence in view of the circumstance that preliminary inquiry had shown moorland water-supplies having dangerous action on lead to be most numerous in the West Riding, and of the fact that comparative test, therefore, of many Yorkshire waters was likely to be called for, it was seen that both such

undertaken in the first instance by Mr. and Mrs
afterwards by Dr. A. C. Houston.

Survey was next made, in association with Dr. T
Thompson, of certain moorland areas in the neigh
and with the result that a gathering ground of the so
at Burnmoor. It comprised a moorland tract from
over or through the peat, and water also issuing fro
to a particular stream, which in turn supplied a
derived the water supply of Bentham village. Thi
been observed to possess from time to time acidity
seriously to interfere with certain manufacturing pr
the village, and also it was known to act on occasion

Upon the gathering ground thus selected the f
chosen for examination:—

(*a.*) The waters of certain springs representi
falling on the gathering ground, had esca
tact with the peat soil, and had been cl
passage through or between strata underly

(*b.*) The waters of certain pools, representing ra
remained in sustained contact with
vegetable organic matter living or dead.

(*c.*) The water of the stream descending to the s
which represented mixture, differing in
to time, of waters (*a*) and (*b*).

Further, with a view of obtaining in regard to th
concurrent meteorological and other necessary da
earth thermometers were established thereon, and
for measuring from time to time the amount of wat
the conjoined stream from the gathering grou
referred to.

Finally, a skilled person was found to underta
visiting the gathering ground early in the morning
week for the purpose of recording the several mete
facts respecting which information was desired, and
of collecting water samples. These, along with re
question, he was under obligation to deliver at the l
each Monday in the forenoon, so that the necessary
water samples might follow as speedily as possible o

The differential examination to which it was de
the Burnmoor water samples, comprised a week-
follows:—

A. Their physical and chemical conditions in refe
(*a.*) Appearance in a 2 ft. tube; colour, turb
(*b.*) Reaction, with cochineal, methyl orange,
(*c.*) Residue on evaporation; total, fixed, and
(*d.*) Ammonia; free, and albuminoid.

(*e.*) Oxidised nitrogen; nitrates, and nitrites.
(*f.*) Oxygen required for oxidising organic matter
(*g.*) Chlorine.
(*h.*) Hardness; total, temporary, and fixed.
(*i.*) Dissolved oxygen.
(*j.*) Iron.
(*k.*) Acidity; quantitative estimation.
(*l.*) Ability to dissolve lead; as shown by the amount of lead taken up by samples under experimental conditions.

Their bacterial constituents—

(*a.*) The number of colonies per cubic centimetre.
(*b.*) The different kinds of micro-organisms to be obtained therefrom in pure culture.
(*c.*) The behaviour of these in various culture media.

formulating the above scheme for different testing of various rs, the members of the Medical Department concerned in this iry had the advantage of the co-operation of Dr. Whitelegge, Medical er of Health of the West Riding County Council. This officer at that time contemplating, and has since carried out on lines lly parallel with those above indicated, study on behalf of his iority of lead poisoning by public water supplies; and to him the rtment is indebted for suggestion of the "lead-shot test" of the ty of a water to dissolve the metal in question. Details of this, ell as of the other methods of procedure adopted at the Settle atory, will be found in Addendum D. to this report.

ystematic observation thus undertaken of the Burnmoor (Bentham) rs was commenced in November 1891, and was continued weekly the end of March 1893. In the course of this sustained scrutiny mples from this gathering ground, much information bearing on the ral history of moorland waters was got together, and not a few of facts recorded have an interest of their own, apart altogether from particular question which was being studied. All the abundant mation thus collected has been tabulated and charted, and in due se will be set out in detail in a further report. At present it be enough to refer to certain only of the facts elicited, in a broad general way and for the purpose of indicating the reason of some equent procedures.

hroughout the extended period during which the waters of the moor gathering ground were under examination, definite distinc- was maintained between samples according as they were derived the "pools" or from the "springs." These waters, *i.e.*, water pools in the peat and water from springs issuing within the s of the gathering ground, differed little at any time as regards mineral constituents; moreover, both were very soft waters. rtheless, they differed widely and persistently in the circumstance "pool" water was found almost without exception to be acid, eas "spring" water was rarely found other than neutral to the tests oyed; indeed, so far as "spring" water was on occasion found acid, appeared due to access to the particular "spring" of rainfall water had recently flowed over the peat surface. Further, and above all, ol" waters and "spring" waters from this gathering ground red in their ability to dissolve lead; "pool" water was invariably d to possess this property, sometimes in high degree; but "spring" r rarely possessed it, and then feebly only as compared with the r. Season appeared to have little effect in modifying the characters ese "spring" waters. "Peat-pool" water was, however, found to be

commenced, pronounced acidity and vigorous act
always it was found to be neutral in its reaction,
destitute of ability to dissolve that metal.

Bacteriologically the several waters, more p
pool" waters, were at all seasons rich in micro-org
as were isolated directly from the waters and
study in a variety of artificial media were not
features of particular interest.

As the outcome, therefore, of exact study of
different classes of waters from the given gathering
of such waters—that obtained from certain pools i
to possess in marked degree, and persistently, a
And further, among a plurality of conditions, p
appertaining to this particular class of water, o
distinctly and uniformly parallel to its property of r
namely, acidity of nearly every sample examined.*
annexed (Addendum E.) to this report serve to illu

These results, in so far as association of acidity
power are concerned, afford, of course, no new kn
again and again been noted in regard of moorland w
to cause lead poisoning, that the samples of water a
on lead are commonly acid samples. As positiv
of direct association of these two conditions, the
moor observations mainly consists in the circumsta
this relation of acidity and lead dissolving ability
the same water over a considerable period of
negative aspects the Burnmoor observations are o
They tend to indicate, by a plurality of determi
many months, not only that the ability of a particu
lead is closely associated with acidity of such wat
action in regard of lead *is not to be* so associa
observed condition to which the water was liable.
therefore, more exact study of the conditions de
moorland water was seen to be called for.

To this stage of the investigation the Burnmoor o
in the main conducted by Mr. and Mrs. Atkinson,
intendence by Dr. Barry; but early in 1893, Dr. B
for office reasons, continuously required in London.

waters; and, *secondly*, of making examination there of waters from a variety of Yorkshire gathering grounds, with a view to comparison, in one and another respect, of these waters with the standards already set up as a result of the procedures that have been described. Accordingly, Dr. Houston took up his residence at Settle early in August 1893, and has since continued to work there on lines determined on from time to time in conference with the Medical Department.

The chief business of Dr. Houston, at Settle, has been, up to the date of this report, observation of moorland waters in reference to inter-relations of their acidity and lead-dissolving property, along with study of the causes of acidity of these waters. But incidentally he has given attention also to another section of the lead-poisoning question; one, indeed, which, at an early stage of the Department's investigation, had given rise to difficulty, namely, certain observed differences in the *modus operandi* of one and the same water in regard of its action on lead. All these directions of work have involved comparison of other waters with Burnmoor water, and for this reason the results, so far obtained by Dr. Houston, will be most conveniently stated in this preliminary report under Heading No. III., which deals with lines of investigation not yet completed, and in regard of which, therefore, inferences are only provisional.

III. Comparison of Moorland Waters from a Plurality of Sources in Yorkshire with the Standards set up as the Result of previous sustained Observation of the Waters of a given Moorland Gathering Ground.

The several lines of work upon which Dr. Houston has engaged have necessarily interlaced at various points, and for this reason they have as far as practicable, been pursued concurrently. The sequence, therefore, in which the several sections of inquiry enumerated below are dealt with does not imply chronological sequence of procedure. It is adopted for reasons of convenience only:—

1. Difference in kind, of the "action" which is exercised by water on lead.
2. Correlation of acidity and lead-dissolving property in regard of moorland waters.
3. The source of the acidity of moorland waters.

Difference in kind of the "Action" which is exercised by Water on Lead.

As has been already indicated, at an early stage of this lead inquiry, it was seen to be requisite to take account of the fact that the term "action on lead," as applied to water samples, includes other action on this metal than the lead-dissolving process with which inquiry at Settle has been for the most part concerned. And similarly Dr. Houston has found, on a more extended basis of observation, that certain waters exhibit, when brought experimentally in contact with metallic lead in open vessels, not only ability to take up lead into solution, but ability to manufacture, as it were, a nearly insoluble lead compound, loosely attached to the lead and not shielding the metal from further attack of like kind. To the first-named property of a given water, the description "plumbo-solvent ability" is, Dr. Houston considers, conveniently applicable; as descriptive of the other process, which, in his view, is essentially erosion of the lead, he proposes the term "erosive ability."

In this connexion, and with a view to differentiating the under which waters exhibit the one and the other property, Dr has made a number of interesting laboratory experiments, t of which may be summarised thus:—

Pure rain-water and pure snow-water.—These wer found neutral in reaction, and none of the samples dissolved lead. All of them, however, eroded lead very v under laboratory conditions.

Distilled water.—A large number of observations sh samples of "acid"* freshly-distilled water possessed grea solving power, but no power at all of eroding this metal. other hand distilled water that was "neutral"† in rea practically no ability to dissolve lead, though it eroded vigorously, and in sustained fashion.

Moorland waters.—Moorland waters that are *acid* possess ability to dissolve lead. At the same time thr they may not, erode this metal. Many moorland wate dissolve lead to a considerable extent possess in regar metal no conspicuous erosive power. Other moorland wa dissolve and erode lead in very decided fashion. Moor waters are all, it would seem, not far removed from pos the one or the other property, or of both properties. On hand moorland *spring* waters are usually free from ability or to erode lead: such waters, indeed, when in admixtur water are capable of lessening or of inhibiting action of the lead.

Natural waters other than rain or moorland waters.—Su (particularly those that have much temporary hardness) a rule, possess ability to dissolve or to erode lead. M indeed, be experimentally shown to be remote from pos either property; moreover, addition, even in small amo "hard" water to distilled waters, or to acid moorlan may, and usually does, remove from them ability to disso erode lead.

Dr. Houston's experiments suffice to show that distinction "plumbo-solvency" and "erosion" may be of importance. It is true, certainly known whether in the actual circumstances water-supply erosion of the lead service pipes, with consequent sion of an insoluble lead salt in the water, is able to occur. Be regard to the fact that, in the laboratory, a moorland water th lead may continue to do so in sustained fashion, whereas (as will appear) a water that dissolves lead, commonly does so only as it retains acidity,—potential erosive quality of water distri public service may very possibly require to be guarded agai if the reaction of the water be not acid. Again, in comm the observed difference in kind of action of water on lead of Dr. Houston's experiments tended to indicate the possibili laboratory conditions) of water losing its ability to dissolve lea acquire, or increase in, erosive power; or at least to border mo than before on possession of this quality. These questions des

* "Acid" in this connexion signifies a distillate the reaction of which the *acid* side of neutrality when tested by delicate reagents such as are at A. (*b.*), page 336.

† "Neutral" in this connexion signifies a distillate that inclined neith acid nor to the alkaline side of neutrality.

will receive, further study. In what follows, as in what has gone before in this report, liability of waters to *dissolve* lead is the chief subject of consideration.

Correlation of Acidity and Lead-dissolving Property in regard of Moorland Waters.

Among the earliest of his procedures after taking charge of the laboratory at Settle, Dr. Houston set to work to test, and has since from time to time continued to test, the characters exhibited by a number of waters from different moors in reference to the facts that had been observed at Burnmoor. The Burnmoor experiments, it will be remembered, indicated that ability of a water to dissolve lead is closely associated with acid reaction of the water, but with no other conditition to which such water is subject. In this way a considerable number of separate waters, all of them of moorland origin, have been compared with each other and with the Burnmoor standard. And as a result, though some such waters do, while others do not, dissolve lead, waters of this class differed conspicuously in one other particular only, namely, as regards acidity. Those that dissolved lead were observed to possess an alkali-neutralising property; whereas those that did not dissolve lead were observed to possess an acid-neutralising property. There was no exception to this rule; whatever the direct source of the sample, whether from stagnant peat pool, from spring on gathering ground, from feeder to moorland reservoir, from service reservoir, or from town tap, this distinction was always maintained. And further, not only was there indication of association of acidity and lead dissolving property, but there was indication also of close relation between amount of acidity and vigour of solvent action on lead.* Direct parallelism of amount of acidity and vigour of lead-dissolving power was not, however, always found in regard of the same water when tested in these respects at different times; and different waters of equal acidity did not necessarily possess equal power of dissolving lead. Each water, indeed, appeared to possess its own standard of relation of lead-dissolving property to acidity; and as the one quality varied naturally, or was artificially made to vary, so did the other, though not necessarily in direct proportion.

In illustration of the close association of lead-dissolving property and acidity under artificially contrived conditions, certain laboratory experiments by Dr. Houston may be here cited:—

Distilled water having ability to dissolve lead and possessing also alkali-neutralising property, lost on boiling both properties. So, too, many moorland waters lost, when boiled, much of their lead dissolving property and of their acidity. But certain moorland waters not only retained both properties after boiling, but manifested them in higher degree than before, to an extent indeed roughly corresponding to their concentration.

Distilled water having ability to dissolve lead and possessing also alkali-neutralising property, lost, when aërated, both properties. So, too, many moorland waters lost when thus dealt with some of their ability to dissolve lead, and lost, also, some of their acidity. But other moorland waters were not influenced in either respect by this process.

Distilled water having ability to dissolve lead and possessing also alkali-neutralising property, lost, when stored in bottles partially filled

* It is not to be inferred from the above statement that solvent action on lead of a water necessarily always disappears completely when the point of neutrality is reached. *See also* footnote to page 338.

In proceeding to search for the source or sourc
land waters, it appeared first of all important to c
its moorland history at which a water acquires
instance, as regards water accumulated in pools i
so to speak, manufactured in the water *in situ*, or
tributed to it in the process of its passage t
therefore, instituted additional laboratory experim
directions.

Acid waters from several separate moorland ga
tested as to the amount of acidity possessed by
collection, and were tested again in like manner
in each instance in various ways :—

(*a*.) After *boiling* ;
(*b*.) After *aëration* ;
(*c*.) After keeping for differing periods of time
filled and stoppered ;
(*d*.) After keeping for differing periods of time
filled and not stoppered ;
(*e*.) After neutralising with sodium carbo
retaining, for differing periods of time, s
in bottles *partially filled and compl*
bottles *partially filled and not stopp*
completely filled and completely stoppere

As a result, Dr. Houston found that :—

Boiling usually greatly reduced the initial a
waters were practically unaffected in this respec
sustained boiling of them increased their acidity
ponding to the concentration of the water.

Aëration usually slightly reduced the initial
waters were altogether unaffected as regards t
process.

Keeping in bottles completely filled and compl
instance gave rise to increase of acidity; usual
diminution of that originally observed.

Keeping in partially filled bottles [illegible]

lates in depressions on the surface of the peat, is practically complete by the time that it has accumulated there; and that thenceforward such water is little likely *by processes set up within it*, to develop increase of acidity. The question, therefore, arose: What are the conditions to which rainfall on peat moorland is subjected, *antecedent* to its accumulations in pools there, that may be thought of as contributing acid quality to moorland water?

That *a something* is contributed by peat to water in sustained contact with it, or flowing over it or through it, had indeed been suggested by certain facts noted in regard of the Burnmoor series of observations; and, as a consequence, Dr. Houston had already commenced a week-by-week examination, chemical and bacteriological, of samples of *peat soil* selected by him on certain moorland gathering grounds. This peat soil he had, on a number of different gathering grounds, found to be, when moist, invariably acid. It occurred to him, therefore, at this juncture to further test his moorland waters the chemical history of which appeared to be complete, by bringing them once again into relation with the moorland, in so far as this might be done by means of a certain "peat essence" prepared by him for this purpose. And this he accomplished as follows:—

1. By adding, always in minute amount, freshly-collected samples of acid moorland waters to sterile (neutral) peat decoction.
2. By adding, in small amount, sterile (neutral) peat decoction to freshly-collected samples of acid moorland water.

The result was, to say the least, interesting. The neutral peat decoction, to which moorland water had been added, showed signs of bacterial growth, and developed in most instances acid reaction, So too, the moorland waters, to which peat decoction had been added, showed signs of bacterial growth, and usually increased in acidity. Thus, it was seen that if the agency dominant in producing the acid in question was contained in the *sterile* peat decoction, this agent must needs be of chemical not of biological nature; whereas, if contained in the moorland waters, it might be the one or the other. Hence followed the inference that failure of moorland waters under laboratory conditions to increase their acidity was due to the circumstance that they had become divorced from the peat; with the further suggestion, namely, that moorland water samples are apt to contain bacteria—no doubt derived from the peat—capable of generating acid when brought in relation with sterile peat decoction.

In these circumstances Dr. Houston instituted additional experiments in which, for the purpose of inhibiting bacterial processes in acid moorland water samples, alcohol as well as sterile peat decoction was added thereto. And he found that in every instance the water thus dealt with failed to develop additional acidity. With this indication that biological considerations were very possibly involved in satisfactory solution of the problem of acidity of moorland waters, Dr. Houston reverted somewhat hopefully to his study of the bacterial constituents of peat soil. His results, so far, in this connexion are briefly as follows:—

> To separate samples of *distilled water* that was neutral in its reaction and which did not dissolve lead, there were added small amounts in each instance of *moist peat soil* from different selected gathering grounds. As a result every sample of distilled water developed in a short while acid reaction and was found to have acquired ability to dissolve lead.
>
> To separate samples of *sterile* (*neutral*) *peat decoction* which did not dissolve lead, there were added minute amounts in each

instance of *moist peat soil* from different gathering grou
a result the samples of peat decoction always developed
growth, and at the same time were usually found to po
reaction and ability to dissolve lead.

Gelatine plates inoculated with material from the s
decoctions that had become acid as a result of addition t
minute amounts of peat soil developed colonies of a v
microbes.

Separated in pure culture and severally retransferred
samples of sterile (neutral) peat decoction, the majori
microbes that had been isolated failed to render this cultur
acid, or to confer on it ability to dissolve lead.

A *minority*, two in number, of the microbes thus isolate
culture *did*, when retransferred to sterile (neutral) peat d
render this medium acid, and they conferred on it at the s
ability to dissolve lead. Provisionally, Dr. Houston h
these microbes "O" and "Q."

Moist peat soil from a variety of gathering grounds when s
to the process of plate culture yielded:—

(*a.*) A number of microbes which, when inoculated in pu
into sterile (neutral) peat decoction, either did n
therein; or, if they grew, produced no acid chan
medium.

(*b.*) Two microbes which, when inoculated into sterile (neut
decoction, multiplied therein with considerable vigo
duced in the medium acid reaction, and conferr
ability to dissolve lead.

These two microbes, which were found to be identical with "
"Q" above referred to, are still subjects of study by Dr. H
A provisional account of them furnished by him will be f
Addendum H. to this report.

ADDENDUM A.

SCHEDULE of QUERIES addressed to MEDICAL OFFICER OF HEALTH, SANITARY DISTRICT.

1. Estimated population (in 1890)?

2. Public water service, and how long established? (If more than one such service in district, please state facts.)
   - (*a.*) Name (or names) by which designated? (If from a company or corporate body supplying other places besides Sanitary District in question, please state facts, as far as known.)
   - (*b.*) Locality of gathering ground or gathering grounds, and distance from Sanitary District obtaining the supply?
   - (*c.*) Whether any of the water is filtered or otherwise "treated" before delivery to the Sanitary District? (If filtered or otherwise "treated," state composition of filter bed or nature of treatment adopted, and how long filtration or other treatment has been practised.)
   - (*d.*) Whether or not lead service pipes or lead cisterns are in use in the district?
   - (*e.*) Approximate number, in each instance, of inhabitants of the Sanitary District obtaining one or another public water supply?

3. Lead Poisoning.
   - (*a.*) In the past; at present; intermittent or continuous?
   - (*b.*) On the whole, increasing or diminishing, and extent of it?
   - (*c.*) Trades, if any, in the Sanitary District to which lead poisoning may in part be referred?

ADDITIONAL REMARKS.

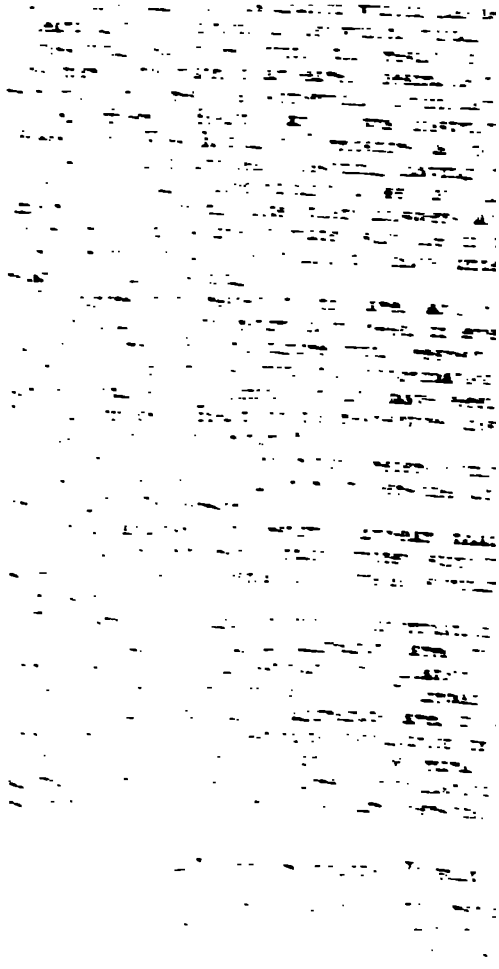

TABLE I

Y of RETURNS with respect to the WATER SUPPLY of the FIVE COUNTY BOROUGHS in the West Riding of Yorkshire.

f Sanitary itrict.	Area in Acres.	Popula-tion, 1881.	Popula-tion estimated, 1890.	In Districts having Public Water Supply. Estimated Population		Popula-tion of Districts totally dependent on Private Sources of Supply.
				Served from Public Source.	Depen-dent on Private Sources.	
1.	2.	3.	4.	5.	6.	7.
- -	10,775	194,495	240,515	240,515	—	—
- -	3,768	73,630	82,500	82,500	—	—
ield -	10,496	81,841	94,253	94,253	—	—
- -	21,572	309,119	363,799	363,700	99	—
- -	19,651	284,508	332,837	330,000	2,837	—
	66,262	943,593	1,113,904	1,110,968	2,936	—

ble II. an analysis is given of the returns with respect to the 137 urban districts, other than county boroughs, from which it will be seen of an estimated population of 1,007,582 persons resident in these 829,180, or 60·5 per cent. of the total, are reported to receive their ipply from public sources leaving, 178,402 persons, or 39·5 per cent. dependent on private sources, of supply.

TABLE II.

RY of RETURNS with respect to the WATER SUPPLY of the 137 BAN SANITARY DISTRICTS (other than County Boroughs) situate in West Riding of Yorkshire.

of Sanitary istrict.	Area in Acres.	Popula-tion, 1881.	Popula-tion estimated, 1890.	In Districts having Public Water Supply. Estimated Population		Popula-tion of Districts totally depen-dent on Private Sources of Supply.
				Served from Public Source.	Depen-dent on Private Sources.	
1.	2.	3.	4.	5.	6.	7.
- -	1,837	3,172	3,700	3,700	—	—
y - -	3,316	1,662	1,674	500	1,174	—
- -	2,605	5,480	6,000	6,000	—	—
nd - -	2,421	2,102	2,000	—	—	2,000
Borough -	2,386	29,790	34,500	34,500	—	—
orough -	2,039	27,505	31,000	31,000	—	—
Improvement t - -	909	8,972	10,000	10,000	—	—
Township -	9,407	9,465	10,000	8,014	1,986	—
aw - -	1,000	2,699	2,700	2,700	—	—
- -	1,154	6,766	7,000	7,000	—	—
le - -	403	7,965	9,220	9,220	—	—
h Wharfedale	3,138	2,550	2,750	2,600	150	—

Table II.—*continued.*

Name of Sanitary District.	Area in Acres.	Population, 1881.	Population estimated, 1890.	In Districts having Public Water Supply. Estimated Population		Pop... tion in Dist... tute... dep... dent... Pri... Sou... of Sup...
				Served from Public Source.	Dependent on Private Sources.	
1.	2.	3.	4.	5.	6.	
Calverley - -	2,074	2,546	2,500	2,000	500	—
Castleford - -	564	10,530	13,000	13,000	—	—
Churwell - -	489	1,973	2,000	2,000	—	—
Clayton - -	1,400	4,301	5,000	2,750	2,250	—
Clayton West - -	1,140	1,435	1,435	1,435	—	—
Cleckheaton - -	1,755	10,653	13,000	13,000	—	—
Cumberworth -	1,185	1,471	1,471	—	—	1,47
Darton - -	4,338	6,014	7,400	6,500	900	—
Denby - -	2,885	1,549	1,559	—	—	1,55
Denholme - -	2,633	3,549	3,670	1,650	2,020	—
Dewsbury Borough -	1,468	29,637	33,200	33,200	—	—
Dodworth - -	1,916	2,989	3,000	3,000	—	—
Doncaster Borough -	1,691	21,139	26,750	26,750	—	—
Drighlington - -	1,136	4,214	4,100	4,100	—	—
Eccleshill - -	1,220	7,037	8,000	8,000	—	—
Elland - -	1,483	8,278	9,500	9,500	—	—
Emley - -	3,356	1,289	1,290	—	—	1,29
Farnley Tyas -	1,785	614	630	400	230	—
Farsley - -	860	4,434	5,500	5,500	—	—
Featherstone - -	4,429	5,901	6,940	3,500	3,440	—
Flockton - -	1,108	1,180	1,320	—	—	1,3
Fulstone - -	2,074	1,906	1,927	—	—	1,9
Gildersome - -	993	3,470	3,500	3,500	—	—
Golcar - -	1,593	7,653	9,300	5,700	3,600	—
Gomersal - -	1,100	3,988	4,000	4,000	—	—
Goole - -	1,002	10,418	16,600	13,000	3,600	—
Greasborough -	2,300	2,914	3,275	—	—	3
Greetland - -	409	4,166	4,650	1,020	3,630	—
Guiseley - -	1,554	3,706	4,050	2,700	1,350	—
Gunthwaite and Ingbirchworth -	2,057	405	405	—	—	
Handsworth - -	3,638	7,645	9,000	7,000	2,000	
Harrogate Borough -	1,287	9,482	14,000	14,000	—	
Haworth - -	360	3,816	4,940	3,640	1,300	
Hebden Bridge -	357	5,007	6,500	3,000	3,500	
Heckmondwike -	697	9,282	10,000	10,000	—	
Hepworth - -	2,304	1,047	1,061	—	—	
Hipperholme -	952	2,934	3,350	3,200	150	
Holme - -	1,728	678	689	—	—	
Holmfirth - -	7,145	8,964	9,056	9,056	—	
Honley - -	2,435	5,070	5,085	3,087	1,998	
Horbury - -	1,279	5,050	5,724	5,724	—	
Horsforth - -	2,801	6,346	7,000	6,750	250	
Hoylandswaine -	2,024	750	750	—	—	
Hunsworth - -	1,380	1,516	1,723	1,600	123	
Idle - - -	1,682	6,643	6,600	4,600	2,000	
Ilkley - -	3,822	4,736	6,000	6,000	—	
Keighley Borough -	1,742	25,427	29,660	29,660	—	
Kirkburton - -	1,286	3,407	3,510	2,925	585	
Kirkheaton - -	1,674	2,747	2,874	1,860	1,014	
Knaresborough and Tentergate Improvement District -	481	5,000	5,000	5,000	—	

TABLE II.—*continued.*

me of Sanitary District.	Area in Acres.	Population, 1881.	Population estimated, 1890.	In Districts having Public Water Supply. Estimated Population		Population of Districts totally dependent on Private Sources of Supply.
				Served from Public Source.	Dependent on Private Sources.	
1.	2.	3.	4.	5.	6.	7.
n - -	1,863	3,019	3,104	1,465	1,639	—
vaite - -	1,320	6,068	7,300	2,135	5,165	—
iedge - -	2,130	12,757	14,200	13,300	900	—
rood - -	1,334	4,661	5,900	3,655	2,245	—
nden Foot -	530	2,891	3,000	2,000	1,000	—
en - -	8,645	3,319	4,000	1,520	2,480	—
am - -	4,692	4,529	5,000	3,750	1,250	—
ey - -	3,492	4,074	4,600	—	—	4,600
rough - -	1,293	6,319	7,200	3,600	3,600	—
ey - -	2,110	2,939	3,120	—	—	3,120
ld - -	3,407	11,508	13,200	12,285	915	—
Bretton -	2,221	2,918	3,200	3,200	—	—
y Borough -	2,765	15,011	19,873	19,873	—	—
rthong - -	795	936	949	—	—	949
nton - -	1,227	8,038	11,000	10,800	200	—
Bierley -	4,309	20,935	22,000	22,000	—	—
owram - -	1,479	3,294	3,294	1,100	2,194	—
rth - -	11,905	5,762	5,900	1,507	4,393	—
Borough -	3,105	10,957	12,500	12,500	—	—
- -	2,370	6,806	8,000	8,000	—	—
len - -	4,504	7,487	7,500	3,250	4,250	—
lope - -	4,259	2,443	2,550	—	—	2,550
one - -	1,133	2,254	2,800	2,400	400	—
fract Borough -	4,078	8,798	10,334	6,888	3,446	—
y - -	2,409	12,314	14,500	14,500	—	—
sbury - -	1,593	6,824	7,550	4,315	3,235	—
mere - -	593	3,660	3,800	2,670	1,130	—
ck - -	1,371	8,039	9,969	9,000	969	—
sthorpe -	358	4,364	5,000	5,000	—	—
on - -	1,559	3,407	3,500	2,675	825	—
arsh - -	2,578	10,179	13,000	13,000	—	—
City - -	1,580	7,390	7,720	7,500	220	—
orth - -	6,548	1,110	1,100	—	—	1,100
rham Borough -	5,995	34,782	36,807	36,807	—	—
ell - -	3,302	5,105	6,500	6,500	—	—
l Magna -	1,617	4,264	5,150	4,000	1,150	—
nonden -	1,806	607	600	—	—	600
s - -	763	1,182	1,089	—	—	1,089
- -	3,760	6,057	5,910	5,910	—	—
- -	1,302	2,754	2,730	2,000	730	—
y - -	1,568	1,687	1,687	395	1,292	—
y - -	1,247	1,593	1,594	220	1,374	—
y -	1,406	15,093	18,500	18,000	500	—
n - -	7,060	3,329	4,020	3,500	520	—
anthorpe -	1,392	3,120	3,120	3,120	—	—
m - -	4,245	9,091	11,700	11,700	—	—
waite - -	3,170	3,882	5,600	—	—	5,600
ill Nether -	562	5,240	5,700	5,700	—	—
ill Upper -	1,897	5,155	5,800	5,500	300	—
Crosland -	1,834	3,048	3,150	2,360	790	—
owram - -	1,683	3,036	3,070	2,200	870	—
by - -	6,100	6,179	6,375	100	6,275	—
by Bridge -	536	8,724	10,000	10,000	—	—

[redacted]

Table III.

Summary of Returns with respect to the Water Supply of the 30 Rural Sanitary Districts situate in the West Riding of Yorkshire.

Name of Sanitary District.	Area in Acres.	Population, 1881.	Population estimated, 1890.	In Districts having Public Water Supply. Estimated Population		Population of Districts totally dependent on Private Sources of Supply.
				Served from Public Source.	Dependent on Private Sources.	
1.	2.	3.	4.	5.	6.	7.
Barnsley - -	17,875	20,616	24,600	15,000	9,600	—
Clitheroe (Yorkshire portion) - -	77,027	5,825	5,825	1,021	4,804	—
Doncaster - -	108,725	24,182	27,165	4,000	23,165	—
Goole - -	42,441	9,140	8,970	—	—	8,970
Great Ouseburn -	60,627	11,955	12,036	2,000	10,036	—
Halifax - -	10,172	9,256	9,750	9,750	—	—
Hemsworth - -	34,831	11,106	14,732	—	—	14,732
Hunslet - -	6,583	5,687	6,462	4,900	1,562	—
Keighley - -	8,187	5,416	5,880	3,779	2,101	—
Knaresborough -	39,468	8,153	8,323	—	—	8,323
Leeds - -	3,091	2,159	2,300	2,300	—	—
Pateley Bridge -	75,063	8,944	9,500	500	9,000	—
Penistone - -	15,823	5,886	6,000	1,400	4,600	—
Pontefract - -	40,392	14,471	15,750	—	—	15,750
Ripon - -	71,640	9,057	9,057	2,090	6,967	—
Rotherham - -	37,729	14,087	18,978	5,000	13,978	—
Saddleworth - -	17,009	12,876	14,000	5,400	8,600	—
Sedbergh - -	52,665	4,079	4,260	1,350	2,910	—
Selby - -	53,224	9,758	9,500	—	—	9,500
Settle - -	151,942	13,800	14,970	6,448	8,522	—
Skipton - -	147,886	24,700	25,850	9,160	16,690	—
Tadcaster - -	72,865	23,955	26,316	1,450	24,866	—
Thorne - -	63,959	12,828	12,562	—	—	12,562
Todmorden - -	19,804	6,991	7,400	—	—	7,400
Wakefield - -	29,812	35,266	42,000	34,700	7,300	—
Wetherby - -	65,940	16,194	17,159	—	—	17,159
Wharfedale - -	51,452	7,190	8,815	2,083	6,732	—
Worksop (Yorkshire portion) - -	20,407	6,204	6,500	2,600	3,900	—
Wortley - -	54,103	31,848	38,720	30,460	8,260	—
York (West Riding portion) - -	6,949	2,350	1,900	680	1,220	—
	1,457,691	373,979	415,280	146,071	174,813	94,396

Upon further analysis of Table III., it appears that in the following eight rural sanitary districts, having an aggregate estimated population of 94,386 persons, no public supply has hitherto been provided:—Goole, Hemsworth, Knaresborough, Pontefract, Selby, Thorne, Todmorden, and Wetherby; while in the remaining 22 districts receiving a portion only of their water supply from public sources, and which have an aggregate estimated population of 320,884 persons, it is reported that no less than 174,813 persons, or 53·3 per cent., are dependent on private sources of supply. From the remarks of the Medical Officers of Health, it is apparent that many of these private supplies are eminently unsatisfactory both as regards quantity and quality.

B.—Public Water Supplies.

Each of the five county boroughs obtain their supplies of water extensive moorland gathering grounds, and each of these corporations, b supplying the districts under their immediate control, sell water to nun other districts. Some notion of the extent to which these corporations in water may be obtained from a consideration of the fact, that of th urban districts other than county boroughs, and of the 22 rural sa districts, which receive some portion of their supply from public sourc of the urban, and eight of the rural districts, obtain the whole or a port their supply from the works of one or other of these bodies.

The municipal corporations of Dewsbury, Barnsley, and Wakefield (are not county boroughs), whose water is obtained solely from moo gathering grounds, also carry on considerable trade in water. They fu supplies to 15 urban and to portions of three rural sanitary districts o the limits of their boroughs.

Water is also supplied in common—but on a less extensive scale, an always from moorland sources—to the whole or to portions of one or additional districts (17* altogether) by the municipal corporations of B (*moorland*), Doncaster (*pasture and arable*), Keighley (*springs and moorl* Ripon (*moorland*), and Rotherham (*springs and pasture*); by the local bo of Castleford (*coal measures*), and Yeadon (*meadow and pasture*); and by Dearne Valley Water Company (*coal measures*).

Certain other districts or portions of districts (in all seven†) obtain w from the following works situate outside the West Riding:—Ashton-un Lyne, Stalybridge, and Dukinfield Waterworks (*moorland*); Chester Rural Sanitary Authority's Waterworks (*moorland*); Clitheroe Corpora Waterworks (*moorland*); Oldham Corporation Waterworks (*moorland*); York Waterworks Company (*River Ouse*).

Of the total 137 sanitary districts in the West Riding having public w supply, only 29 (24 urban and five rural) obtain the whole of such service sources within their own respective areas, and do not part with any portio their supply to other districts. Of the 29 in question, 10 (all of them u districts) obtain their supplies from moorland gathering grounds, 11 urban and five rural) from local springs, six (all urban) from deep wells, (urban) from pasture and arable gathering ground, and one (urban) fr river.

C.—Lead Poisoning in Connexion with Public Water Supplie

In making analysis of the information obtained with respect to poisoning, it will be necessary to deal with the various supplies seriatim, in some detail.

(a.) *Bradford County Borough Waterworks.*

The water supply of the Bradford Corporation is almost wholly der from high moorland, and is given by two separate services, known as "High Level" and "Low Level" services respectively.

The sources of the supply to the low level service lie to the north of B ford, in the valleys of the Rivers Aire and Wharfe. Before delivery to sumers this water is passed through a thickness of eight feet of filte material composed of layers of sand and sandstone.

The sources of supply for the high level service lie to the west of Bradf in the upland valleys of the Denholme Beck and River Worth, both tributa of the River Aire. None of this water is submitted to processes of filtra before delivery to consumers.

* Of these 17, one, getting water from Batley, is supplied also by Huddersfield; one, ge water from Keighley, is supplied also by Bradford; one, getting water from the Dearne V Co., is supplied also by Barnsley.

† Of the seven, one, getting water from Chesterfield, is supplied also by Sheffield.

In Table IV. a summary is given showing the estimated population of the several districts receiving their water supply from the Bradford high level and low level services respectively, together with the chief facts reported with respect to lead poisoning observed amongst the consumers of the water.

TABLE IV.

BRADFORD CORPORATION WATERWORKS.

District.	Estimated Population supplied from Bradford Corporation Waterworks.			Occurrence of Plumbism reported by the Medical Officers of Health for the several Districts as due to Water Supply.		
	Total.	High Level.	Low Level.	In the Past.	At Present.	Intermittent or Continuous.
1.	2.	3.	4.	5.	6.	7.
Bradford, U.	240,515	110,000	130,515	Yes	Yes	Intermittent.
Bingley Improvement District	3,000	—	3,000	—	—	—
Bingley, U.	1,000	1,000	—	—	—	—
Birkenshaw, U.	2,700	2,700	—	Yes	Yes	Intermittent.
Birstal, U.	7,000	7,000	—	Yes	Yes	Intermittent.
Calverley, U.	500	—	500	—	—	—
Clayton, U.	2,750	2,750	—	Yes	Yes	Not stated.
Cleckheaton, U.	13,000	2,250	10,750	—	—	—
Denholme, U.	375	375	—	Yes	Yes	Not stated.
Drighlington, U.	4,100	4,100	—	Yes	Yes	Intermittent.
Eccleshill, U.	8,000	8,000	—	Yes	Yes	Intermittent.
Farsley, U.	5,500	—	5,500	—	—	—
Gildersome, U.	3,500	3,500	—	Yes	Yes	Intermittent.
Gomersal, U.	4,000	4,000	—	Yes	Yes	Intermittent.
Hunsworth, U.	1,600	—	1,600	—	—	—
Idle, U.	4,600	2,100	2,500	—	—	—
Liversedge, U.	13,300	4,700	8,600	—	—	—
North Bierley, U.	22,000	22,000	—	Yes	Yes	Continuous.
Pudsey, U.	14,500	14,500	—	Yes	Yes	Intermittent.
Queensbury, U.	4,315	4,315	—	Yes	—	Intermittent.
Shelf, U.	2,000	2,000	—	Yes	—	Intermittent.
Silsden, U.	3,500	—	3,500	—	—	—
Skipton, R. (Addingham)	1,300	—	1,300	—	—	—
Thornton, U.	4,500	4,500	—	—	—	—
Tong, U.	6,800	6,800	—	Yes	Yes	Intermittent.
Windhill, U.	7,000	1,000	6,000	—	—	—
	381,355	207,590	173,765			

From the above table it will be seen that water is supplied from the Bradford Corporation Waterworks to the borough of Bradford, and as well to portions of 25 sanitary districts (24 urban and 1 rural) outside the limits of the borough.

The total population so supplied is estimated at 381,355 persons, and of these, it is estimated that 173,765 receive their supply from the low level, and 207,590 from the high level service. Amongst the consumers of the low level water, whether resident inside or outside the borough of Bradford, no case of plumbism due to water has been observed. But on the other hand, amongst the consumers of the high level water, lead poisoning is reported to have been more or less extensively prevalent, in Bradford, Birkenshaw, Birstal, Clayton, Denholme, Drighlington, Eccleshill, Gildersome, Gomersal, North Bierley, Pudsey, Queensbury, Shelf, and Tong. In one district (the Crossflatts portion of the Bingley Township Urban Sanitary District), where 1,000 persons receive their supply solely from this high level service, and in the

following urban districts—Cleckheaton, Idle, Liversedge, and Wi supplied from both high and low level services, no cases of plumbis been observed. At Thornton, also, no cases of plumbism have been ob but here the high level water is, prior to delivery to consumers, mix spring water obtained from the millstone grit.

In the districts where the water supply is reported to have given rise poisoning, such poisoning is stated to have been continuous in char one district only, namely, North Bierley. In two districts, Clay Denholme, no observations with respect to this point have apparent made; whilst in the remaining 11 districts lead poisoning is stated been intermittent in character.

(b.) *Halifax County Borough Waterworks.*

The water supply of the Halifax Corporation is derived from m situate in the upland valleys of the Rivers Hebble, Luddenden, Widd Greave. This water is not submitted to any process of filtration delivery to consumers.

In Table V. a summary is given showing the estimated population several districts receiving their water supply from these waterworks, t with the chief facts reported with respect to lead poisoning observed a the consumers of the water.

TABLE V.

HALIFAX CORPORATION WATERWORKS.

District.	Estimated Population supplied from Halifax Corporation Waterworks.	Observations by Medical Officers Health with respect to Lead Poiso due to the Water Supply.
1.	2.	3.
Halifax, U. - -	82,500	No recent lead poisoning. *See* tex
Brighouse, U. -	9,220	None observed.
Elland, U. - -	9,500	"
Greetland, U. -	1,020	"
Hebden Bridge, U. -	3,000	"
Hipperholme, U. -	3,200	"
Horbury, U. - -	5,724	"
Northowram, U. -	1,100	"
Ovenden, U. - -	3,250	40 cases of lead poisoning in 1884.
*Rastrick, U. -	9,000	None observed.
Soothill Upper, U. -	5,500	"
Southowram, U. -	2,200	"
Sowerby, U. - -	100	"
Sowerby Bridge, U. -	10,000	"
Thornhill, U. -	9,600	"
Halifax, R. - -	8,250	"
	163,164	

* The water is mixed before delivery to consumers with spring water r sandstone.

From the above table it will be seen that water is supplied from the H Corporation Waterworks to the borough of Halifax and to portions sanitary districts (14 urban, one rural) outside the limits of the borough. total population so supplied is estimated at 163,164 persons. Among consumers of the Halifax water, no cases of plumbism have been ob during the last five or six years; but the Medical Officer of Halifax r that a number of cases occurred in that borough in 1880–81, when the H Head reservoir was first brought into use; that suspicion was then t upon some materials used in the construction of this reservoir, in conseq

TABLE I

SUMMARY of RETURNS with respect to the WATER SUPPLY of the FIVE COUNTY BOROUGHS in the West Riding of Yorkshire.

Name of Sanitary District.	Area in Acres.	Population, 1881.	Population estimated, 1890.	In Districts having Public Water Supply. Estimated Population		Population of Districts totally dependent on Private Sources of Supply.
				Served from Public Source.	Dependent on Private Sources.	
1.	2.	3.	4.	5.	6.	7.
Bradford - -	10,775	194,495	240,515	240,515	—	—
Halifax - -	3,768	73,630	82,500	82,500	—	—
Huddersfield -	10,496	81,841	94,353	94,253	—	—
Leeds - -	21,572	309,119	363,799	363,700	99	—
Sheffield - -	19,651	284,508	332,837	330,000	2,837	—
	66,262	943,593	1,113,904	1,110,968	2,936	—

In Table II. an analysis is given of the returns with respect to the 137 urban sanitary districts, other than county boroughs, from which it will be seen that out of an estimated population of 1,007,582 persons resident in these districts, 829,180, or 60·5 per cent. of the total, are reported to receive their water supply from public sources leaving, 178,402 persons, or 39·5 per cent. who are dependent on private sources, of supply.

TABLE II.

SUMMARY of RETURNS with respect to the WATER SUPPLY of the 137 URBAN SANITARY DISTRICTS (other than County Boroughs) situate in the West Riding of Yorkshire.

Name of Sanitary District.	Area in Acres.	Population, 1881.	Population estimated, 1890.	In Districts having Public Water Supply. Estimated Population		Population of Districts totally dependent on Private Sources of Supply.
				Served from Public Source.	Dependent on Private Sources.	
1.	2.	3.	4.	5.	6.	7.
Altofts - -	1,837	3,172	3,700	3,700	—	—
Austonley - -	3,316	1,662	1,674	500	1,174	—
Baildon - -	2,605	5,430	6,000	6,000	—	—
Barkisland - -	2,421	2,102	2,000	—	—	2,000
Barnsley Borough -	2,386	29,790	34,500	34,500	—	—
Batley Borough -	2,039	27,505	31,000	31,000	—	—
Bingley Improvement District - -	909	8,972	10,000	10,000	—	—
Bingley Township -	9,407	9,465	10,000	8,014	1,986	—
Birkenshaw - -	1,000	2,699	2,700	2,700	—	—
Birstal - -	1,154	6,766	7,000	7,000	—	—
Brighouse - -	403	7,965	9,220	9,220	—	—
Burley in Wharfedale	3,138	2,550	2,750	2,600	150	—

Table II.—*continued.*

Name of Sanitary District.	Area in Acres.	Population, 1881.	Population estimated, 1890.	In Districts having Public Water Supply. Estimated Population		Population of Districts totally dependent on Private Sources of Supply
				Served from Public Source.	Dependent on Private Sources.	
1.	2.	3.	4.	5.	6.	7.
Calverley - -	2,074	2,246	2,500	2,000	500	—
Castleford - -	564	10,530	13,000	13,000	—	—
Churwell - -	489	1,973	2,000	2,000	—	—
Clayton - -	1,400	4,301	5,000	2,750	2,250	—
Clayton West -	1,140	1,435	1,435	1,435	—	—
Cleckheaton - -	1,755	10,653	13,000	13,000	—	—
Cumberworth -	1,185	1,471	1,471	—	—	1,471
Darton - -	4,358	6,014	7,400	6,500	900	—
Denby - -	2,885	1,559	1,559	—	—	1,559
Denholme - -	2,653	3,549	3,670	1,650	2,020	—
Dewsbury Borough -	1,468	29,637	33,200	33,200	—	—
Dodworth - -	1,916	2,989	3,000	3,000	—	—
Doncaster Borough -	1,691	21,139	26,750	26,750	—	—
Drighlington - -	1,136	4,214	4,100	4,100	—	—
Eccleshill - -	1,220	7,037	8,000	8,000	—	—
Elland - -	1,483	8,278	9,500	9,500	—	—
Emley - -	3,556	1,289	1,290	—	—	1,290
Farnley Tyas -	1,785	614	630	400	230	—
Farsley - -	860	4,434	5,500	5,500	—	—
Featherstone - -	4,429	5,901	6,940	3,500	3,440	—
Flockton - -	1,108	1,180	1,320	—	—	1,320
Fulstone - -	2,074	1,906	1,927	—	—	1,927
Gildersome - -	993	3,470	3,500	3,500	—	—
Golcar - -	1,593	7,653	9,300	5,700	3,600	—
Gomersal - -	1,100	3,988	4,000	4,000	—	—
Goole - -	1,002	10,418	16,600	13,000	3,600	—
Greasborough -	2,300	2,914	3,275	—	—	3,275
Greetland - -	409	4,166	4,650	1,020	3,630	—
Guiseley - -	1,554	3,706	4,050	2,700	1,350	—
Gunthwaite and Ingbirchworth -	2,057	405	405	—	—	405
Handsworth - -	3,638	7,645	9,000	7,000	2,000	—
Harrogate Borough -	1,287	9,482	14,000	14,000	—	—
Haworth - -	360	3,816	4,940	3,640	1,300	—
Hebden Bridge -	357	5,007	6,500	3,000	3,500	—
Heckmondwike -	697	9,282	10,000	10,000	—	—
Hepworth - -	2,304	1,047	1,061	—	—	1,061
Hipperholme -	952	2,934	3,350	3,200	150	—
Holme - -	1,728	678	689	—	—	689
Holmfirth - -	7,145	8,964	9,056	9,056	—	—
Honley - -	2,435	5,070	5,085	3,087	1,998	—
Horbury - -	1,273	5,050	5,724	5,724	—	—
Horsforth - -	2,801	6,346	7,000	6,750	250	—
Hoylandswaine -	2,024	750	750	—	—	750
Hunsworth - -	1,380	1,516	1,723	1,600	123	—
Idle - - -	1,682	6,643	6,600	4,600	2,000	—
Ilkley - -	3,822	4,736	6,000	6,000	—	—
Keighley Borough -	1,742	25,427	29,660	29,660	—	—
Kirkburton - -	1,286	3,407	3,510	2,925	585	—
Kirkheaton - -	1,674	2,747	2,874	1,860	1,014	—
Knaresborough and Tentergate Improvement District -	481	5,000	5,000	5,000	—	—

(e.) *Sheffield County Borough Waterworks.*

The water supply of the Sheffield Corporation is derived from moorland gathering grounds, and is given in two separate services known as the "high level" and "low level" supplies respectively. The high level supply is obtained from gathering grounds at Redmires, situate some five or six miles west of Sheffield. The low level supply is obtained from gathering grounds situate in the upland valleys of the Rivers Rivelin and Locksley, both tributaries of the River Don. These gathering grounds lie immediately to the north of the gathering grounds for the high level service. None of the water is submitted to any process of filtration, but since March 1890 special treatment has been applied to the high level water prior to its delivery to consumers. This treatment has consisted of the addition of as much finely powdered chalk to the water as it is capable of dissolving.

In Table VIII. is given a list of the districts (situate in the West Riding), with their respective estimated populations, supplied from the Sheffield Waterworks, together with notes on lead poisoning where such has been observed by the Medical Officers of Health.

TABLE VIII.

SHEFFIELD CORPORATION WATERWORKS.

District.	Estimated Population supplied from Sheffield Corporation Waterworks.			Occurrence of Plumbism reported by the Medical Officers of Health for the several Districts as due to Water Supply.		
	Total.	High Level.	Low Level.	In the Past.	At Present.	Intermittent or Continuous.
1.	2.	3.	4.	5.	6.	7.
Sheffield, U. -	330,000	110,000	—	Yes	To a less extent.	Intermittent.
	—	—	220,000	None	None.	—
Handsworth, U. -	7,000	7,000	—	—	—	—
*Rotherham, R. -	3,000	3,000	—	—	—	—
Wortley, R. -	25,260	20,760	—	Yes	None.	—
	—	—	4,500	None	None.	—
	365,260	140,760	224,500			

* Tin-lined pipes adopted in this district along with Sheffield water service.

From the above table it will be seen that water is supplied from the Sheffield Corporation Waterworks to the borough of Sheffield and to portions of three sanitary districts (one urban, two rural) situate in the West Riding of Yorkshire, outside the limits of the borough. The population so supplied is estimated at 365,260 persons, and of these it is estimated that 140,760 receive their supply from the high level, and 224,500 from the low level service. With respect to these figures it must be, however, noted that the area of supply of the one and the other service is being continually changed and that consequently the above estimates must be regarded as only roughly approximate. Amongst the consumers of the low level water, whether resident inside or outside the borough of Sheffield, no case of plumbism due to water supply has been observed. On the other hand, numerous cases of plumbism attributable to the water supply have been observed amongst the consumers of the high level service resident in Sheffield and in the rural sanitary district of Wortley. No cases of plumbism have apparently been observed amongst consumers of the high level water living in either the Handsworth Urban or in the Rotherham Rural Sanitary Districts; but in the latter, it is to be noted, that tin-lined service pipes are compulsory. In those portions of the area of high

level service where the water is said to have given rise to lead poisoning poisoning is stated to have been intermittent in character. By the courte Dr. Thomson, medical officer of health for Sheffield, I am enabled to gi Appendix B.* a list of all the deaths certified to have been due to plum registered in the borough of Sheffield from 1874 to 1889, inclusive. this list it will be observed that in recent years fatal cases of lead pois have occurred in which the poisoning has been attributed to drinkin Redmires (high level) water.

[In addition to the population living in the West Riding supplied water from the Sheffield Works, it is estimated that nearly 5,000 pe resident in the Ecclesall Bierlow Rural District, situate in Derbyshire, r their water supply from that source. The greater proportion of these ar to be supplied from the high level service. Amongst this population ca lead poisoning due to the water supply are said to have occurred from ti time.]

(f.) *Barnsley Corporation Waterworks.*

The water supply of the Barnsley Corporation is derived from moor gathering grounds situate at Ingbirchworth, near Penistone, about nine west of Barnsley. The water has, for the past 18 years, been filtered thr sand and gravel, and for the last three years through layers of sand and stone, each 2 ft., and through a layer of broken limestone, 1 ft. 6 in thickness.

A list of the districts supplied with water from the Barnsley Corpor Waterworks, together with their estimated populations, is given in Table

TABLE IX.

BARNSLEY CORPORATION WATERWORKS.

District.	Estimated Population supplied from Barnsley Corporation Waterworks.	Observations by Medical Off of Health, with respect to L Poisoning due to the Water Supply.
1.	2.	3.
Barnsley, U. - - -	34,500	Five cases in Barnsley, and in Dodworth, reported in and 1888, in houses where lead service pipes were unusual length.
Darton, U. - - -	6,500	No cases of plumbism observ
Dodworth, U. - -	3,000	*See* above.
Monk Bretton, U. - -	3,200	No cases of plumbism observ
Worsborough, U. - -	8,700	" " "
Barnsley, R. (Ardsley and Cudworth) - - -	6,000	" " "
Penistone, R. (Silkstone) -	1,400	" " "
	63,300	

From the above table it will be seen that water is supplied to the bor of Barnsley, and to portions of six sanitary districts (four urban, two r outside the limits of the borough. The total population so supplie estimated at 63,300 persons. A limited number of cases of plumbism, amo persons using this water, were observed in 1885 and in 1888 in Barnsley Darton; but in each of the cases, the Medical Officer of Health reports the lead service pipes were of unusual length.

(g.) *Batley Corporation Waterworks.*

The water supply of the Batley Corporation is derived from moor gathering ground situate near to Brockholes, in the township of Netherth

* Not here reproduced.

some 30 miles south-west of the borough. The water is not filtered prior to its delivery to consumers.

It is estimated that 31,000 persons living in the borough of Batley receive their supply from this source, and 152 persons in Honley are likewise reported to obtain their supply from the Batley Works.

The Medical Officer of Health for Batley reports the constant prevalence in the borough of lead poisoning amongst the consumers of the water, in fact, to such an extent does this exist, that he considers himself justified in stating that fully one-half of the patients he sees in his practice, suffer more or less from the water supply. No cases of plumbism have been observed amongst the consumers of the Batley water living in Honley.

(h.) *Castleford Local Board Waterworks.*

The water supply of Castleford is obtained from a well sunk in the coal measures to a depth of 50 feet. The water is not submitted to any process of filtration prior to delivery to consumers.

It is estimated that 13,000 persons living in the urban sanitary district of Castleford receive their supply from this source, and 700 persons resident in Allerton-Bywater, in the Tadcaster Rural Sanitary District, are also reported to obtain their supply from the Castleford Works. No cases of plumbism attributable to the water supply have been observed amongst the consumers of this water.

(i.) *Dearne Valley Waterworks Company.*

The water supply of the Dearne Valley Company is derived from a deep well sunk in the coal measures near to Wombwell. The water is not submitted to any process of filtration before delivery to consumers.

It is estimated that the Company furnishes water to 11,000 persons living in the urban sanitary district of Wombwell, and to 8,000 persons living in Nether Hoyland and Darfield, in the rural sanitary district of Barnsley. No cases of plumbism attributable to water supply have been observed amongst the consumers of this water.

(k.) *Dewsbury and Heckmondwike Water Board.*

The water furnished by the Dewsbury and Heckmondwike Water Board is obtained from moorland gathering ground situate at Durnford Bridge, about 16 miles south-west from Dewsbury. The water is not submitted to any process of filtration prior to delivery to consumers. A list of the districts supplied with water from this source, with their estimated populations, and notes with respect to lead poisoning, are given in Table X.

TABLE X.

DEWSBURY AND HECKMONDWIKE WATER BOARD.

District.	Estimated Population supplied from the Dewsbury and Heckmondwike Water Board.	Observations by Medical Officers of Health with respect to Lead Poisoning due to the Water Supply.
1.	2.	3.
Dewsbury, U. -	33,200	Four cases in 1889.
Clayton West, U. -	1,435	Four cases in February 1891.
Heckmondwike, U. -	10,000	—
Ossett, U. - -	12,500	A few instances where lead service pipes were found of unusual length.
Ravensthorpe, U. -	5,000	—
Skelmanthorpe, U. -	3,120	—
Soothill Nether, U. -	5,700	One case where lead service pipe was of unusual length.
	70,955	

APP. A. No. 13.

On the Causes of Lead Poisoning: by Mr. Power.

From the above table it will be seen that water is supplie
Dewsbury and Heckmondwike Water Board to the borough of Dew
the local board district of Heckmondwike, and to portions of f
sanitary districts outside the limits of the above-named districts.
population so supplied is estimated at 70,955.

Amongst the consumers of the Dewsbury water, four cases of p
attributable to the water, are reported to have occurred in the bo
Dewsbury in 1889, and four more cases in the Clayton West Urban
in February of the present year (1891). A few instances have also
served, where the lead service pipes have been of unusual length, in th
of Ossett and in the Clayton West and Soothill Nether Urban
whilst, in the remaining urban districts of Heckmondwike, Ravensth
Skelmanthorpe, no cases of plumbism, due to the water, have been b
the knowledge of the respective Medical Officers of Health.

(l.) *Doncaster Corporation Waterworks.*

The water supply of the Doncaster Corporation is obtained from g
ground consisting chiefly of pasture, with some arable land, overlyi
nesium limestone, in the parishes of Conisborough and Rewenfiel
nine miles south-west of Doncaster. The water is passed through
material of sand and gravel, 5 ft. in thickness, prior to its del
consumers.

It is estimated that 26,750 persons living in the borough of D
receive their supply from this source, and 4,000 persons living in W
Balby, and Hexthorpe, in the Doncaster Rural Sanitary District,
reported to obtain their supply from the Doncaster Works.

No cases of plumbism attributable to the water supply have been
amongst the consumers of this water.

(m.) *Keighley Corporation Waterworks.*

The water supply of the Keighley Corporation is derived partly from
and partly from moorland gathering grounds, and is given in four
services, known as the (*a*) Calversyke, (*b*) Sheddles, (*c*) Park Lane,
Green House supplies, respectively. Of these, (*a*), (*c*), and (*d*) are
from springs, all situate within the borough, and (*b*) from gathering
on the Stanbury and Trawden Moors, situate at a distance of from
eight miles west of Keighley.

None of the supplies obtained from springs are filtered or otherwise
before delivery to consumers. But the Sheddles water, which forms t
supply for the borough of Keighley, is filtered through rubble and fi
and is further treated before entering the Keighley supply reservoir
passed through a conduit 120 yards long, filled with Derbyshire limesto
addition powdered lime is daily contributed to the water in the conduit

It is estimated that a population of 1,700 persons, all resident wit
borough, obtain their water from supplies (*a*), (*c*), and (*d*); and, simila
estimated that 34,061 persons resident in Keighley and in portions
urban sanitary districts outside the limits of that borough, are suppli
Sheddles water. A list of these districts is given below:

District.	Estim Popul
Keighley Borough - - - - - - -	27,3
Bingley Township, U. (part of), (Cross Roads and Wesley Place)	4,
Oakworth, U. (part of) :—	
Oakworth village - - - - - 1,206	
Utley, High and Low - - - - - 301	
	1,5
	34,0

Amongst the consumers of this water resident in Keighley, cases of lead poisoning were formerly very frequent; but since the water has been treated as stated above, isolated cases only have been observed. In Cross Roads and Wesley Place (Bingley Township, U. and in Oakworth village (Oakworth, U.), cases of lead poisoning have been observed from time to time; and with respect to these districts, it is to be noted that their water is drawn direct from the main conduit, and consequently, is not submitted to any process of filtration or treatment prior to its delivery to these places. In High and Low Utley (Oakworth, U.) no cases of lead poisoning attributable to water have been observed; but to this portion of the district the water is delivered from the Keighley service reservoir after it has been submitted to the special treatment already referred to. The lead poisoning is stated to have been intermittent in character in all the districts affected.

The Medical Officer of Health for Keighley reports that the greater number of cases occur in the months of March and August.

(n.) *Ripon Corporation Waterworks.*

The water supply of the Ripon Corporation has, since 1888, been obtained from moorland gathering grounds situate at Lumley Moor, seven miles from the city. The water is filtered through layers of sand, 2 ft. 6 ins., rubble, 2ft., and large stones, 1 ft. 6 ins. in thickness, prior to delivery to consumers.

It is estimated that 7,500 persons living in the city of Ripon receive their supply from this source, and 500 persons, living in Bishopton, Urebank, Sharow, Studley Royal, and Lindrick, in the Ripon Rural Sanitary District, are also reported to obtain their supply from the Ripon Works.

No cases of plumbism attributable to the water supply have, up to the present time, been observed amongst the consumers of the water.

(o.) *Rotherham Corporation Waterworks.*

The water supply of the Rotherham Corporation is obtained partly from springs and partly from a gathering ground situate at Dalton, 3½ miles south-east of the borough.

The water is filtered through sand and gravel prior to its delivery to consumers. It is estimated that 36,807 persons, living in the borough of Rotherham, receive their supply from this source, and 13,000 persons living in the Rawmarsh Urban Sanitary District are reported to obtain their water supply from these works.

No cases of plumbism, attributable to the water supply, have been observed amongst the consumers of the Rotherham water.

(p.) *Wakefield Corporation Waterworks.*

The water supply of the Wakefield Corporation has, since 1888, been obtained from moorland gathering grounds situate at Rishworth, some 26 miles west-south-west from Wakefield.

The water has not hitherto been submitted to any process of filtration or treatment prior to its delivery to consumers.

In Table XI. a summary is given, showing the estimated populations of the several districts receiving their water supply from these works together with notes as to the occurrence of lead poisoning amongst consumers.

TABLE XI.

WAKEFIELD CORPORATION WATERWORKS.

District.	Estimated Population supplied from Wakefield Corporation Waterworks.	Occurrence of Plumbism rep by the Medical Officers of He the several Districts as du Water Supply.		
		In the Past.	At Present.	Inter Cont
1.	2.	3.	4.	
Wakefield, U. - -	33,676	Yes	Yes	Conti
Altofts, U. - -	3,700	Yes	Yes	Interm
Featherstone, U. - -	3,500	—	—	-
Normanton, U. - -	10,800	—	—	-
Sandal Magna, U. -	4,000	Yes	Yes	Interm
Whitwood, U. - -	5,000	Yes	Yes	Conti
Wakefield, R. - -	34,700	Yes	Yes	Interm
	95,376			

From the above table it appears that water is supplied from the Wa Corporation Waterworks to the city of Wakefield, and to portions sanitary districts (five urban, one rural) situate outside the limits of t The total population so supplied is estimated at 95,376 persons. In districts, with the exception of the Featherstone and Normanton Urban S Districts (to which the supply has only been laid on for a few months poisoning is reported to have been more or less prevalent amongst the cons of this water.

In the urban districts of Altofts and Sandal Magna, and in the district of Wakefield, the poisoning is stated to have been intermitt character; whilst in the urban districts of Wakefield and Whitwood it is re to have been continuous. With respect to the Wakefield water supply interesting to observe that the Medical Officer of Health for the urban s district of Rishworth, in which the gathering grounds of the Wakefield works are situate, reports that the private supply of the Rishworth Gr School, obtained from moorland gathering ground in that district possesses plumbo-solvent properties.

(q.) *Yeadon Waterworks Company.*

The water supply of the Yeadon Water Company is derived partly fr surface drainage of elevated meadow and pasture land, and partly from sunk in the sandstone near to Yeadon. The water is stated to be imp filtered though sand and gravel before delivery to consumers. It is est that this company furnishes water to 7,693 persons living in the urban s district of Yeadon, and to 2,000 persons living in the adjoining urban s district of Rawdon. No cases of plumbism attributable to this water have been observed amongst the consumers of the water living in Yeadon case is reported to have occurred 12 or 13 years ago in Rawdon, in a where the service pipe was of unusual length.

(r.) *Waterworks outside the West Riding furnishing public supplies to Di within the Riding.*

In Table XII. is given a summary of the information obtained with to those sanitary districts situate in the West Riding which obtain the or part of their water supply from works outside the Riding.

Table XII.

Waterworks situate outside the West Riding which furnish Public Water Supply to 7 Sanitary Districts within the Riding.

Name by which Waterworks designated.	Districts or portions of Districts supplied.	Estimated Population receiving Supply.	Source.	Filtered or Treated.	Remarks with respect to Lead Poisoning (if any).
1.	2.	3.	4.	5.	6.
Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Waterworks Joint Committee.	Upper Mill, U. Saddleworth, R. (part of), Greenfield, Saddleworth, Delph.	1,000 5,400	Moorland	No.	—
Chesterfield Rural Sanitary Authority's Waterworks.	Rotherham, R. (Beighton).	2,000	Moorland	Treated with limestone.	—
Clitheroe Corporation Waterworks.	Clitheroe, R. (part of), West Bradford.	311	Moorland	No.	—
Oldham Corporation Waterworks.	Quickmere, U. -	2,670	Gathering grounds in upper valleys of Irwell and Medlock.	No.	—
York Waterworks Company.	Great Ouseburn, R (part of), Acomb.	2,000	River Ouse.	Filtered.	—
	York, R. (part of), Dringhouses, and Middlethorpe.	680			
		14,061			

From this table it will be seen that the waterworks outside the Riding, from which public supply is obtained, are five in number—three being situate in Lancashire, one in Derbyshire, and one in the North Riding of Yorkshire. These works furnish public supplies to portions of seven sanitary districts in the West Riding (two urban and five rural). The population supplied from these works is estimated at 14,061.

In none of the districts receiving these outside supplies have any cases of plumbism, attributable to water supply, been observed.

(8.) *Urban Sanitary Districts having Public Water Supply from Local Sources.*

In Table XIII. is given a summary of the information obtained with respect to the public water supply of urban sanitary districts where such supply is obtained from local sources.

Table XIII.

Summary of information with respect to the Public Water 31 Urban Sanitary Districts in which the Supply is who obtained from Local Sources.

(Where the name of the district is printed in *Italics*, no portion of the public is obtained from sources outside the district.)

District.	Name by which Water Supply designated.	Estimated Population receiving Supply.	Source.	Filtered or Treated.
1.	2.	3.	4.	5.
Austonley, U. -	The Public Tank -	500	Spring -	No.
Baildon, U. -	Baildon Waterworks	6,000	Springs on Baildon Moor.	No.
Bingley, I. D. (part of).	Bingley Reservoir -	7,000	Surface springs	No.
Bingley Township, U. (part of).	(*a.*) Cullingworth Water Supply.	1,600	Springs -	No.
„ „	(*b.*) Cottingley Water Company.	820	Springs -	No.
Burley-in-Wharfedale, U.	Burley Local Board Waterworks.	2,600	Springs on Burley Moor.	No.
Calverley, U. (part of).	Thornhill's Reservoir	1,500	Springs -	No.
Denholme, U. (part of).	Foster's Water Supply	1,275	Springs -	No.
Farnley Tyas, U. -	Farnley Tyas Water Supply.	400	Farnley Moor	No.
Golcar, U. (part of)	Taylor's Waterworks	1,550	Springs -	No.
Goole, U. - -	Goole Gas and Water Company.	13,000	Deep well in new red sandstone.	No.
Guiseley, U. -	Guiseley Waterworks	2,700	Well in red sandstone.	No.
Harrogate, U. -	Harrogate Waterworks Company.	14,000	Haverah Park	Filtered
Haworth, U. -	Haworth Local Board Waterworks.	3,640	Springs and moorland.	No.
Holmfirth, U. -	(*a.*) Holmfirth Reservoir.	5,556	Snape Farm -	No.
„ „ -	(*b.*) Newfold Tank -	3,500	Newfold -	No.
Horsforth, U. -	Horsforth Waterworks Company.	6,750	Horsforth and Yeadon Moor.	Filtered.
Ilkley, U. - -	Ilkley Local Board Waterworks.	6,000	Ilkley Moors -	No.
Knaresborough and Tentergate, U.	Knaresborough Waterworks.	5,000	River Nidd -	Filtered.
Luddendenfoot, U.	Whitworth's Reservoir.	2,000	Blackwood Hall.	No.
Meltham, U. -	Meltham Local Board Waterworks.	3,750	Springs -	No.
Mexborough, U. -	Mexborough Water Company.	3,600	Well in coal measures.	No

TABLE XIII.—*continued.*

District.	Name by which Water Supply designated.	Estimated Population receiving Supply.	Source.	Filtered or Treated.	Remarks with respect to Lead Poisoning (if any).
1.	2.	3.	4.	5.	6.
Otley, U.	Otley Waterworks	8,000	Streams	No.	—
Penistone, U.	Penistone Waterworks	2,400	Moorland and deep springs.	No.	—
Pontefract, U.	Pontefract Corporation Waterworks.	6,888	Deep wells in coal measures.	No.	—
Rawdon, U, (part of).	(*a.*) Billing and Tough's Reservoir.	600	Drifts into Billing Hill.	No.	—
„ „	(*b.*) Peacock Inn Supply.	75	Drift	No.	—
Selby, U.	Selby Waterworks	5,910	Bore-holes in the new red sandstone.	No.	—
Shipley, U.	Eldwick Waterworks	18,000	Rombald's Moor.	No	One case only where long service pipe in use.
Skipton, U.	Skipton Waterworks	11,700	Rombald's Moor and pasture land.	Partly filtered.	—
Stocksbridge, U.	(*a.*) Low Level Service.	4,320	Springs	No.	—
„ „	(*b.*) High Level Service.	540	Springs	No.	—
Swinton, U.	Swinton Local Board Waterworks.	10,000	Well in carboniferous sandstone.	Treated with milk of lime and filtered.	—
Todmorden, U.	(*a.*) Todmorden Waterworks Company.	1,150	Moorland	No.	—
„ „	(*b.*) Greenwood's Trustees.	800	Springs	Yes.	—
„ „	(*c.*) Various	960	Springs	No	In a few isolated cases where long service pipes have been in use.
Wath-upon-Dearne, U.	West Melton Water Company.	6,000	Pasture and arable land.	Filtered.	—
		170,084			

The above table refers to a population of 170,084 persons, resident in the 31 urban sanitary districts, who receive their supply from local sources. In the case of three districts only, those of Harrogate, Shipley, and Todmorden have isolated cases of plumbism, due to water supply, been observed; and all the cases are stated to have occurred in houses furnished with lead service pipes of unusual length.

(t.) *Rural Sanitary Districts having Public Water Supply from Local Sources.*

In Table XIV. a summary is given of the information obtained with respect to the public water supply of rural sanitary districts when such supply is obtained from local sources.

Table XIV.

Summary of Information with respect to the Public Wat 13 Rural Sanitary Districts in which the Supply is Local Sources.

(Where the name of the district is printed in *Italics*, no portion of the publ is obtained from sources outside the district.)

Names of Rural Sanitary Districts and Townships supplied.	Name by which Water Supply designated.	Estimated Population receiving Supply.	Source.	F T
1.	2.	3.	4.	
Barnsley, R. (part of): (Carlton)	Earl of Wharncliffe's Waterworks.	1,000	Partly gathering ground and partly from coal pit.	
Clitheroe, R. (part of): (*a.*) Waddington	(*a.*) Waddington Waterworks.	447	Moorland	
(*b.*) Bashall Eaves	(*b.*) Taylor's Reservoir	263	Spring	
Halifax, R. (part of): Norland	Norland Waterworks	1,500	Moorland	
Hunslet, R. (part of): Temple Newsam	Temple Newsam Waterworks.	2,200	Pasture land and springs.	
Keighley, R.: (*a.*) Steeton and Eastburn.	Steeton Waterworks	1,215	Springs	
(*b.*) Sutton	Sutton Waterworks Company.	1,237	Springs	
(*c.*) East Morton	East Morton Waterworks Company.	1,030	Springs	
(*d.*) Morton Banks	Morton Banks Water Company.	297	Springs	
Pateley Bridge, R.: Pateley Bridge	Pateley Bridge Waterworks.	500	Pateley Moor	
Ripon, R. (part of): (*a.*) North Lees	Ripon Rural Sanitary Authority's Water Services.	40	Local springs within townships supplied.	
(*b.*) Hutton Conyers		100		
(*c.*) Rainton		400		
(*d.*) Bishop Monkton.		500		
(*e.*) Markington		250		
(*f.*) Melmerby		300		
Sedbergh, R.: (*a.*) Sedbergh	Sedbergh Waterworks	1,000	Gathering ground and springs.	Fil
(*b.*) Dent	Dent Water Supply	350	Spring	
Settle, R.: (*a.*) Settle and Giggleswick.	Settle and Giggleswick Waterworks.	2,515	Springs in Scaleber.	
(*b.*) Ingleton	Ingleton Waterworks	1,080	Springs in Ingleborough.	Filt
(*c.*) High and Low Bentham.	Bentham Waterworks	1,377	Moorland stream	Filt
(*d.*) Long Preston	Long Preston Water Company.	657	Springs	
(*e.*) Burton-in-Lonsdale.	Burton-in-Lonsdale Water Company.	594	Springs	
(*f.*) Clapham	Clapham Water Supply.	225	Ingleborough Lake.	Filt

TABLE XIV.—*continued.*

Names of Rural Sanitary Districts and Townships supplied.	Name by which Water Supply designated.	Estimated Population receiving Supply.	Source.	Filtered or Treated.	Remarks with respect to Lead Poisoning (if any).
1.	2.	3.	4.	5.	6.
Skipton, R. (part of):					
(*a.*) Gargrave	Gargrave Rural Sanitary Authority Waterworks.	900	Thorlber Fell springs.	No.	—
(*b.*) Crosshills and Glusburn.	Crosshills and Glusburn Water Company.	1,200	Ling Haw springs.	No.	—
(*c.*) Farnhill	Farnhill Water Company.	500	Moor Edge springs.	No.	—
(*d.*) Bradley	Bradley Water Company.	400	Lowersire Bank springs.	No.	—
(*e.*) Embsay	Embsay Water Company.	700	Embsay Fell	Filtered.	—
(*f.*) Carleton	Carleton Water Company.	650	Springs	No.	—
(*g.*) Cowling	Cowling Water Company.	1,500	Springs	No.	—
(*h.*) Kelbrook	Kelbrook Water Company.	540	Spring	No.	—
(*i.*) Salterforth	Salterforth Water Company.	220	Spring	No.	—
(*k.*) Grassington	Grassington Water Company.	450	Spring	No.	—
(*l.*) Cononley	Cononley Water Company.	560	Gib Side	No.	—
(*m.*) Hebden	Hebden Rural Sanitary Authority Waterworks.	240	Scar Side	No.	—
Wharfedale, R. (part of):					
(*a.*) Menston	Menston Waterworks Company.	500	Moorland	No.	—
(*b.*) Bramhope	Bramhope Waterworks Company.	258	Deep wells	No.	—
(*c.*) Esholt	Esholt Waterworks	180	Deep springs	No.	—
(*d.*) Hawksworth	Hawksworth Waterworks.	100	Deep springs	No.	—
(*e.*) Poole	Poole Waterworks	574	Springs and moorlands.	No.	—
(*f.*) Timble	Timble Waterworks	171	Spring	No.	—
Worksop, R.: (Yorkshire portion):					
(*a.*) South Anston	South Anston Rural Sanitary Authority Water Supply.	700	Gathering ground.	No.	—
(*b.*) Kiveton	Kiveton Water Supply	1,300	Springs	No.	—
(*c.*) Harthill	Harthill Water Supply	600	Well bored in gritstone.	No.	—
Wortley, R. (part of):					
(*a.*) Wortley	Wortley Waterworks	4,000	Wharncliffe Estate.	No.	—
(*b.*) Oughtibridge	Oughtibridge Waterworks.	1,200	Springs	No.	—
		36,520			

The above table refers to a population estimated at 36,520 persons, resident in the 13 rural sanitary districts who receive a public water supply from local sources. These local supplies are 47 in number, and furnish supplies to groups of persons varying from 40 to 4,000 in number. The supplies are drawn from very varied sources, yet amongst the consumers of these waters no cases of plumbism have hitherto been observed which could be attributed to the water.

Summary of facts enumerated.

(*a.*) As regards water supply :

(1.) Of the total population of the West Riding of Yorksh 18 per cent. do not, at the present time, receive wa from public sources.

(2.) In the county boroughs practically the whole populati water supply from public sources.

(3.) In the urban sanitary districts, other than county bo little over 60 per cent. of the population receive wat from public sources, whilst nearly 40 per cent. still private sources for water.

(4.) In the rural sanitary districts, only some 40 per ce population receive water supply from public sour 60 per cent. still depend on private sources for wate

(*b.*) As regards lead poisoning in relation with water supply :

(1.) The waters supplied from the works of six of the tradi rations, namely, Bradford (high level supply), Hu Sheffield (high level supply), Batley, Keighley, a field, are each reported to have exhibited strong solvent property ; whilst water supplied by the Dew Heckmondwike Water Board, and water from so Todmorden Waterworks, apparently possesses plumb property in a minor degree.

(2.) The population of the several districts supplied with w the above-named works, and subject to lead apparently attributable to water supply, amount aggregate to upwards of 700,000 persons.

(3.) In certain districts where water supply is also obta the works first enumerated, and which have an population of upwards of 60,000 persons, no cas poisoning have been observed.

(4.) All the waters reported to have plumbo-solvent proper West Riding of Yorkshire are derived from gathering grounds.

(5.) In the majority of the districts subject to plumbism poisoning is stated to be intermittent in character.

May, 1891.

ADDENDUM C.

RECORDS of WATER SUPPLIES in the SANITARY DISTRICTS of the COUNTIES of LANCASTER, CUMBERLAND, and WESTMORLAND, collected as introductory to an investigation by the MEDICAL DEPARTMENT of the LOCAL CONDITIONS affecting the SOLUBILITY of LEAD by WATER; by MR. T. W. THOMPSON.

In accordance with instructions having reference to the investigation, entrusted to the Department, into the occurrence of lead poisoning in association with public water supplies, and into the conditions under which such supplies acquire ability to dissolve the lead of pipes and cisterns, I have addressed to the Medical Officers of Health of the several urban and rural sanitary districts in the counties of Lancaster, Cumberland, and Westmorland —counties in which the water supplies were known to be largely derived from upland gathering grounds—a set of questions, designed to obtain certain preliminary data as to water supply, along with facts as to the occurrence or not of lead poisoning in connexion therewith.

In this memorandum I now submit certain analyses of the replies received from the different health officers, and certain tabular returns of the data upon which such analyses are based. The data in question consist in the main, district by district, of the information supplied by the Medical Officers of Health, arranged in a form to facilitate reference; but they are supplemented as regards particular districts by matter (printed in italics) obtained from Medical Officers of Health of other districts also supplied with the water that comes in question. On these returns I have also noted the area of each district as given in the 1881 Census Report; and as regards each urban sanitary district the population for 1881 and 1891, as given in the recently published Preliminary Census Report. The 1881 population entered in each instance on the returns for the rural sanitary districts is taken from the 1881 Census Report; but the estimated population in 1890 for each of these districts was supplied by the Medical Officer of Health for each district.

Throughout this memorandum, except in these introductory remarks, the three counties above named are dealt with separately, being taken in the order of their relative importance from the point of view of population. Thus, first for Lancashire, next for Cumberland, and lastly for Westmorland, the data got together are dealt with as follows:—

1. Tables I., II., and III., in which the *sanitary areas* of the county are the governing units; such areas being grouped according as they are county boroughs (Table I.),* urban sanitary districts (Table II.), or rural sanitary districts (Table III.). These tables show (col. 5) the estimated population in each different sanitary area receiving water by public service, and similarly (cols. 6 and 7), the estimated population dependent on private sources of supply.
2. Tables IV.,† V., VI., and VII., in which *water supplies* in the county are the governing units; the water supplies being grouped according as they belong to county boroughs, to water companies and trusts, to urban sanitary districts, or to rural sanitary districts. These tables show (col. 2) the several districts or localities served by each water service; the estimated population (col. 3) in each instance receiving such supply; the source or sources of the water (col. 4); certain facts as to "treatment" of the water and its delivery to customers (cols. 5, 6, and 7); and finally (col. 8), the presence or absence of lead poisoning among such consumers as recorded by the Medical Officers of Health of the districts supplied therewith.
3. ‡A return for the county of the replies received from the Medical Officers of Health to the different districts; these replies being grouped

* There being no county boroughs in Cumberland and Westmorland, Table I. will not be found in the analyses for those counties.

† There being no county boroughs in Cumberland or Westmorland, Table IV. will not be found in the analyses for those counties.

‡ In view of the summary of these data which is given in Tables IV., V., VI., and VII. it has not been deemed requisite to reproduce here the full district returns appended to Mr. Thompson's memorandum.

separately according as they relate to county boroughs, urba districts, or rural sanitary districts—the areas in each gr dealt with in alphabetical order.

Before proceeding to deal with each county separately, it ne pointed out that these records, taken collectively, have reference to supplies of an extensive district with an area of upwards of 2,676, and a population of some 4,356,000 persons. Apart, therefore, immediate object with which they have been obtained, they promis useful for purposes of general reference.

Also it will be convenient here to summarise the information obt

(a.) *As regards water supply:*

(1.) Of the total population of each of the three counties u sideration, nearly 7 per cent. in the case of Lancash cent. in the case of Cumberland, and nearly 59 per cent. of Westmorland, are at present unprovided with any pu supply.

(2.) Of the county boroughs in Lancashire, practically all the i obtain their water from some public source.

(3.) Of the urban sanitary districts, other than county borough mately 6 per cent. of the population of those in Lancas cent. of those in Cumberland, and 3 per cent. of those morland are still dependent upon private sources of supp

(4.) Of the rural sanitary districts, some 54 per cent. of the of those in Lancashire, 75 per cent. of those in Cumbe 93 per cent. of those in Westmorland are also still depen private sources of supply.

(b.) *As regards lead poisoning in relation with water supply:*

(1.) Conspicuous lead poisoning has only been heard of in conn two public water supplies in Lancashire, viz., the Roch ration supply and the supply of the Rossendale Water though in a minor degree lead poisoning has been mainly with the Darwen Corporation supply, Skelsmersdale L supply, and apparently also to a slight extent in the pa supplies of The Fylde and Tintwistle Companies. S Lancashire waters would also appear to have ability to upon lead, but no notable amount of plumbism has been observed to follow their use.

(2.) With the exception of a past history of lead poisoning, association with the Whitehaven Local Board's water lead poisoning attributable to public water supply has of either in Cumberland or Westmorland, though in counties the plumbo-solvent action of the waters, if th such, is largely obscured by the scarcity of lead service cisterns.

(1.) Lancashire.

Replies to the questions above referred to, and reproduced in Ap have been received from the Medical Officers of Health to 15 districts situated either wholly or partly in the county of Lanc having an aggregate area of 1,203,708 acres, and a population 4,020,328 persons.

Of these 4,020,328 persons it appears that, approximately, 9 obtain water from some public service, while rather less than 7 pe dependent upon private sources of supply.

Three of the above-mentioned 152 districts, viz., Crumpsall Urba Heath Urban, and Openshaw Urban, have recently been added to Manchester. The information furnished by the late Medical Health to these districts is entered on the return, but the populat districts is included in that of Manchester.

The remaining 149 districts comprise (*a*) 15 county boroughs, having collectively in 1891 a Census population of 2,208,737 persons; (*b*) 113 urban sanitary districts, having in 1891 a Census population of 1,490,159 persons; and (*c*) 21 rural sanitary districts, having in 1890 an estimated population of 321,432 persons.

A.—Water Supplies: Public and Other.

In Table I.A. will be found certain general data with respect to the water supply of the 15 county boroughs in the county of Lancaster, from which it will be seen that out of an aggregate population of 2,208,737 persons, it is estimated that 2,205,137, or practically 99·8 per cent., obtain their water supply from public services, while only about 3,600, or rather less than 0·2 per cent. of the whole, are dependent upon private sources.

Table I.A. [Lancashire.]

Summary of Returns with respect to the Water Supply of the 15 County Boroughs wholly or partly situate in the County of Lancaster.

Name of County Borough.	Area in Acres. (1881 Census Report.)	Population, 1881. (Preliminary Census Report, 1891.)	Population, 1891. (Preliminary Census Report, 1891.)	In County Boroughs having Public Water Supply. Estimated Population		Population of County Boroughs wholly dependent on Private Sources of Supply.
				Served from Public Source.	Dependent on Private Sources.	
1.	2.	3.	4.	5.	6.	7.
Barrow-in-Furness	10,456	47,259	51,712	51,712	—	—
Blackburn	6,974	104,014	120,064	119,564	500	—
Bolton	2,404	105,414	115,002	115,002	—	—
Bootle	1,207	27,374	49,217	49,217	—	—
Burnley	1,731	63,339	87,058	87,058	—	—
Bury	3,390	54,717	57,206	57,206	—	—
Liverpool	5,210	552,508	517,951	517,951	—	—
Manchester	4,293	462,303	505,343	505,343	—	—
Oldham	4,730	111,343	131,463	131,463	—	—
Preston	3,721	96,537	107,573	107,573	—	—
Rochdale	4,172	68,866	71,458	68,458	3,000	—
St. Helens	6,586	57,403	71,288	71,188	100	—
Salford	5,170	176,235	198,136	198,136	—	—
Stockport	2,200	59,553	70,253	70,253	—	—
Wigan	2,188	48,194	55,013	55,013	—	—
Totals	64,432	2,035,059	2,208,737	2,205,137	3,600	--

In Table II.A. will be found similar data with respect to the water supply of 113 urban sanitary districts in the county of Lancaster, from which it will be seen that out of an aggregate population of 1,490,159 persons, it is estimated that 1,402,783, or 94 per cent., obtain their water supply from public services, while 87,376, or nearly 6 per cent., are dependent upon private sources. It will further be seen that as regards the four urban sanitary districts of Croston, Rainford, Standish-with-Langtree, and Upholland, which together have a population of 15,365 persons, no public provision has at present been made in the matter of water supply.

TABLE II.A. [LANCASHIRE.]

SUMMARY of RETURNS with respect to the WATER SUPPLY of 1 SANITARY DISTRICTS (other than COUNTY BOROUGHS) sit wholly or in part within the County of LANCASTER.

Name of Urban Sanitary District.	Area in Acres. (1881 Census Report.)	Population, 1881. (Preliminary Census Report, 1891.)	Population, 1891. (Preliminary Census Report, 1891.)	In Urban Districts having Public Water Supply. Estimated Population*	
				Served from Public Source.	Dependent on Private Sources.
1.	2.	3.	4.	5.	6.
Abram - -	1,982	2,638	4,309	4,259	*50*
Accrington -	3,425	31,435	38,603	38,603	—
Adlington - -	1,064	3,258	4,190	4,190	—
Allerton - -	1,586	830	914	914	—
Ashton-in-Makerfield	6,250	9,824	13,379	*10,846*	*2,533*
Ashton-under Lyne	1,391	37,040	40,494	40,494	—
Aspull - -	1,905	8,113	8,952	8,952	—
Astley Bridge -	1,768	5,613	6,239	*6,139*	*100*
Atherton - -	2,426	12,602	15,833	15,833	—
Audenshaw -	1,165	5,936	6,547	6,547	—
Bacup - -	6,400	25,034	23,498	*4,240*	*19,258*
Barton, Eccles, Winton, and Monton - -	2,261	21,786	29,606	29,606	—
Billinge - -	4,591	3,882	3,996	3,866	130
Birkdale - -	2,215	8,705	12,387	12,387	—
Blackpool - -	3,496	14,229	23,846	*23,596*	*250*
Blackrod - -	2,388	4,234	4,021	4,021	—
Brierfield - -	1,017	4,088	5,888	*5,838*	*50*
Castleton-by-Rochdale - -	2,344	4,017	4,857	4,340	517
Chadderton -	3,082	16,899	22,087	*21,887*	*200*
Childwall - -	1,729	187	199	199	—
Chorley - -	3,614	19,478	23,082	23,082	—
Church - -	528	4,850	5,870	5,870	—
Clayton-le-Moors -	1,059	6,695	7,155	7,155	—
Clitheroe - -	2,375	10,176	10,815	10,600	215
Colne and Marsden	5,329	11,971	16,774	16,774	—
Crompton - -	2,864	9,797	12,901	12,851	50
Croston - -	2,361	1,791	2,034	—	—
[Crumpsall† -	733	—	—	—	—
Dalton-in-Furness -	7,223	13,339	13,300	13,300	—
Darwen - -	5,918	29,744	34,192	32,692	1,500
Denton and Haughton -	1,706	12,711	13,993	13,793	200
Droylsden - -	1,144	8,687	9,482	9,482	—
Failsworth - -	1,073	7,912	10,425	10,425	—
Farnworth - -	1,502	20,708	23,758	23,758	—
Fleetwood - -	1,800	6,733	9,274	9,274	—
Fullwood - -	2,117	3,725	4,112	*4,006*	*106*
Garston - -	1,625	10,271	13,444	13,444	—
Gorton - -	1,484	12,031	15,215	*15,162*	*53*

* The figures in columns 5 and 6 in *italics* are estimates of my own, b the replies of the Medical Officers of Health.—T. W. T.

† Recently added to Manchester.

TABLE II.A. [LANCASHIRE]—*continued.*

Name of Urban Sanitary District.	Area in Acres. (1881 Census Report.)	Population, 1881. (Preliminary Census Report, 1891.)	Population, 1891. (Preliminary Census Report, 1891.)	In Urban Districts having Public Water Supply. Estimated Population*		Population of Urban Districts wholly dependent on Private Sources of Supply.
				Served from Public Source.	Dependent on Private Sources.	
1.	2.	3.	4.	5.	6.	7.
Grange	1,160	1,150	1,733	1,633	100	—
Great Crosby	1,768	5,033	6,400	6,400	—	—
Great Harwood	2,863	6,287	9,073	9,073	—	—
Haslingden	3,627	16,298	18,225	17,000	1,225	—
Haydock	2,409	5,863	6,535	*6,509*	*26*	—
Heaton Norris	1,564	5,797	7,164	7,164	—	—
Heywood	3,496	22,979	23,286	23,286	—	—
Hindley	2,611	14,715	18,973	18,973	—	—
Horwich	3,254	3,761	12,850	12,700	150	—
Hurst	540	6,384	6,772	6,772	—	—
Huyton-with-Roby	3,054	4,060	4,625	4,625	—	—
Ince-in-Makerfield	2,320	16,007	19,255	19,255	—	—
Kearsley	997	7,253	7,993	*7,900*	*93*	—
Kirkham	857	3,840	3,995	*3,589*	*106*	—
Lancaster	1,494	24,239	31,038	31,038	—	—
Lathom	8,694	4,161	4,371	205	4,166	—
Lees	202	3,511	3,877	3,872	5	—
Leigh	6,192	21,734	28,702	28,702	—	—
Levenshulme	606	3,557	5,506	5,506	—	—
Leyland	3,726	4,961	5,972	4,500	1,472	—
Litherland	850	2,426	4,441	4,441	—	—
Littleborough	7,737	10,406	10,878	9,000	1,878	—
Little Crosby	1,811	553	641	212	*429*	—
Little Hulton	1,707	5,714	6,697	6,697	—	—
Little Lever	807	4,413	5,168	5,168	—	—
Little Woolton	1,388	1,159	1,131	1,131	—	—
Longridge	3,123	3,705	4,101	3,500	601	—
Lytham	2,238	4,122	4,656	4,636	20	—
Middleton	4,585	18,953	21,310	*21,110*	*200*	—
Milnrow	5,264	7,013	8,046	5,364	2,682	—
Morecambe	1,725	3,931	6,476	6,476	—	—
Mossley	1,500	13,850	14,162	14,162	—	—
Moss-side	420	18,131	23,833	23,833	—	—
Much Woolton	795	4,541	4,545	4,545	—	—
Nelson	827	10,381	22,700	22,700	—	—
[Newton Heath†	1,350	—	—	—	—	—]
Newton-in-Makerfield	3,103	10,580	12,861	12,000	861	—
Norden	6,033	4,043	3,955	2,400	1,555	—
[Openshaw†	579	—	—	—	—	—]
Ormskirk	573	6,651	6,298	6,298	—	—
Orrell	1,618	4,299	4,914	4,914	—	—
Oswaldtwistle	4,883	12,206	13,296	13,296	—	—
Padiham and Hapton	950	8,974	11,311	11,311	—	—
Pemberton	2,894	13,762	18,400	18,000	400	—
Prescot	268	6,419	6,745	6,745	—	—
Prestwich	1,917	8,627	7,869	7,869	—	—

* *See* Note * on p. 372. † Recently added to Manchester.

TABLE II.A. [LANCASHIRE]—*continued.*

Name of Urban Sanitary District.	Area in Acres. (1881 Census Report.)	Population, 1881. (Preliminary Census Report, 1891.)	Population, 1891. (Preliminary Census Report, 1891.)	In Urban Districts having Public Water Supply. Estimated Population*	
				Served from Public Source.	Dependent on Private Sources.
1.	2.	3.	4.	5.	6.
Radcliffe - -	2,453	16,267	20,020	20,020	—
Rainford - -	5,872	3,745	3,472	—	—
Ramsbottom -	290	16,142	16,726	14,000	2,726
Rawtenstall -	1,667	28,913	29,507	19,672	9,835
Reddish - -	1,541	5,557	6,854	6,854	—
Rishton - -	2,983	4,055	6,010	6,010	—
Royton - -	2,112	11,433	13,395	13,395	—
St. Anne's-on-Sea -	3,292	1,179	2,588	*2,538*	*50*
Skelmersdale -	1,941	5,707	6,627	6,627	—
Southport - -	3,665	32,206	43,026	43,026	—
Stalybridge -	806	25,977	26,783	26,783	—
Standish-with Langtree - -	3,265	4,261	5,416	—	—
Stretford - -	3,255	19,018	21,751	21,751	—
Swinton and Pendlebury - -	2,166	18,107	20,197	20,197	—
Toxteth Park -	1,500	10,368	21,046	21,046	—
Trawden - -	6,808	2,164	2,354	1,800	554
Turton - -	4,614	5,653	6,354	4,766	1,588
Tyldesley-with-Shakerley -	2,490	9,954	12,891	12,801	90
Ulverstone - -	3,120	10,008	9,948	9,848	100
Upholland - -	4,685	4,435	4,443	—	—
Walton-le-Dale -	4,683	9,286	10,556	9,070	1,486
Walton-on-the-Hill	1,907	18,536	40,304	40,304	—
Warrington -	1,442	42,552	52,742	52,742	—
Waterloo-with-Seaforth -	740	9,118	17,328	17,328	—
Wavertree - -	1,838	11,097	13,764	13,764	—
West Derby -	5,561	33,614	38,291	30,000	8,291
Westhoughton -	4,341	9,197	11,077	10,100	977
Whitefield - -	2,048	9,516	10,781	10,781	—
Whitworth - -	8,000	11,892	9,766	4,883	4,883
Widnes - -	3,339	24,935	30,011	*29,911*	*100*
Withington -	5,728	17,109	25,729	*25,629*	*100*
Wuerdle and Wardle	3,086	4,640	3,952	3,902	50
Totals - -	308,557	1,214,059	1,490,159	1,402,783	72,011

* *See* Note * on p. 372

In Table III.A. will be found similar data with respect to the sanitary districts in the county of Lancaster, from which it will that, out of an aggregate estimated population of 321,432 persons, it puted that 148,619, or only about 46 per cent. of the whole, obtain water supply from public sources, while as many as 172,813 persons, o 54 per cent., are dependent upon private sources of supply.

TABLE III.A. [LANCASHIRE.]

SUMMARY of RETURNS with respect to the WATER SUPPLY of 21 RURAL SANITARY DISTRICTS situate wholly or partly within the County of LANCASTER.

Name of Rural Sanitary District.	Area in Acres. (1881 Census Report.)	Population, 1881. (1881 Census Report.)	Population, 1890. (Estimated.)	In Rural Districts having Public Water Supply. Estimated Population		Population of Rural Districts wholly dependent on Private Sources of Supply.
				Served from Public Source.	Dependent on Private Sources.	
1.	2.	3.	4.	5.	6.	7.
Ashton-under-Lyne -	21,360	14,560	12,433	*11,400*	*1,033*	—
Barton-upon-Irwell -	17,755	19,195	26,550	26,000	550	—
Blackburn - -	20,647	8,103	8,102	2,320	5,782	—
Bolton - -	25,032	24,679	27,636	*27,136*	*500*	—
Burnley - -	46,910	21,672	27,000	7,100	19,900	—
Bury - -	20,882	24,719	15,224	12,000	3,224	—
Chorley - -	43,691	18,242	19,000	290	18,710	—
Clitheroe - -	30,889	7,501	7,500	2,000	5,500	—
The Fylde - -	47,349	10,807	11,850	6,110	5,740	—
Garstang - -	61,115	12,375	13,000	3,250	9,750	—
Lancaster - -	59,279	16,244	14,786	5,200	9,586	—
Leigh - -	13,248	12,028	5,250	5,000	250	—
Lunesdale - -	75,734	7,132	7,132	1,435	5,697	—
Ormskirk - -	73,574	25,782	30,888	10,370	20,518	—
Prescot - -	34,290	15,698	17,083	6,956	10,127	—
Preston - -	53,895	15,907	14,387	1,956	12,431	—
Prestwich - -	4,972	17,606	16,365	*15,500*	*565*	—
Ulverstone - -	129,621	19,184	20,000	300	19,700	—
Warrington - -	24,214	12,323	16,560	1,900	14,660	—
West Derby -	14,561	4,550	5,000	1,210	3,790	—
Wigan - -	11,701	5,554	5,686	1,186	4,500	—
Totals - -	830,719	313,861	321,432	148,619	172,813	—

(B.) PUBLIC WATER SUPPLIES AND LEAD POISONING.

In Tables IV.A. to VII.A. will be found an analysis of the circumstances, as regards source, delivery, and distribution, of the public water supplies in the county of Lancaster; together with information as to the recognised presence or apparent absence of lead poisoning in connexion with such supplies.

These tables also illustrate the extent to which trade in water is carried on in Lancashire. In this connexion it appears that out of the total 143 sanitary districts to which, exclusive of the six county boroughs named below, the Lancashire returns refer, no less than 86 (three county boroughs, 74 urban sanitary districts, and nine rural sanitary districts) obtain either the whole or a part of their water supply from one or other of the following six county borough corporations or three water companies or water trusts, viz., the Bolton, Bury, Liverpool, Manchester, Oldham, and Rochdale Corporations, and the Accrington Gas and Water Company, the Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Waterworks Joint Committee, and the Fylde Water Company. The population thus supplied by these nine bodies, exclusive of the population of the districts proper to the six corporations enumerated, amounts to some 1,280,000 persons. The total population supplied by them (i.e., including the population of the six county boroughs) amounts to over 2,677,000 persons, or about 66 per cent. of the population of the whole 149 districts included in the Lancashire return.

Water trading in Lancashire is also carried on on a smaller scale by ot
county boroughs, urban sanitary authorities, and water companies.

As regards lead poisoning, it would seem, from the information given
column 8 of the tables now under consideration, that very few of
Lancashire water supplies at present exhibit, or have in the past exhibi
any very vigorous action on lead pipes.

Considering first the twelve water supplies possessed by county borou
(Table IV.A.), the evidence on this point is, except in the case of a sin
water supply (that of the Rochdale Corporation), to the effect that almost
lead poisoning, clearly referable to public water supply, has been obser
Moreover, as regards several of these supplies, and this is notably the
with respect to the supplies of Liverpool and Manchester, the import of
evidence is enhanced by the fact that it comes from a number of indepen
sources. It would therefore seem that so far, at least, no conspicuous amo
of lead poisoning has occurred as a consequence of the use of eleven of
twelve waters in question. Nevertheless it is worthy of note that the majo
of these waters appear to be obtained, either exclusively or largely, f
moorland gathering grounds.

But although as regards these eleven waters there is absence of evidence
to their acting vigorously upon lead pipes, the conclusion that they have
action whatever upon such pipes would not seem warranted, and as reg
certain of them there is some indication of the opposite being the case.
will be seen by reference to Table IV.A., column 8. Still, in view of
large population supplied by these waters, but little importance can
attached to the insignificant record of lead poisoning in connexion with th
except, perhaps, in so far as this might give rise to suspicion, either of m
lead poisoning having occurred than has actually been observed, or of
possibility of such slight tendency to act upon lead as these waters ha
apparently, hitherto displayed, becoming at some future time increased.

In the case of the Rochdale water, however, the case is different, and
would seem that this water, or some of it, for it is obtained from three differ
gathering grounds, has at times a vigorous action upon lead. The facts
far as at present ascertained, are as follows:—In addition to the cou
borough of Rochdale, that corporation supplies water to a considera
population in the Castleton-by-Rochdale, Littleborough, Milnrow, Whitwor
and Wuerdle and Wardle Urban Sanitary Districts, and a relief supply to
Middleton Urban Sanitary District, which, however, is stated to be seldo
used.

As regards the Milnrow District the Medical Officer of Health reports th
he has heard of no lead poisoning, and none has been reported to him since
appointment. And from the Castleton-by-Rochdale District it is reported t
no lead poisoning which could be attributed to the water in question
come under notice. The Medical Officer of Health to the Middleton Distr
(mainly supplied by the Heywood Corporation) replies "no cases kno
definitely about." On the other hand, the Medical Officer of Health to
Rochdale County Borough states that he has had cases of lead poisoning
the past, and also has such at present, though he is unable to speak definit
as to their number. The lead poisoning in Rochdale, which he reports
diminishing, he attributes partly to the ordinary trades of painting and plum
ing, but to some extent he evidently regards it as due to the public water supp
for he refers to cases in houses "where the pipe is lead and some distance fr
"the iron mains." In the Whitworth District lead poisoning is reported
having been "exceedingly common" when the Rochdale water was first u
there, but as now diminishing and rare. But from both the Littleborough a
Wuerdle and Wardle Districts come accounts of extensive and increasing l
poisoning. In the Wuerdle and Wardle District (estimated populat
receiving Rochdale water 3,902 out of 3,952) the Medical Officer of Hea
estimates that 50 cases came under his observation recently, during a period
12 months; and as regards the Littleborough District the Medical Officer
Health refers to 40 or 50 cases in "two months." The Wuerdle and War
District was apparently first supplied with Rochdale water in 1876, and but
cases of lead poisoning were observed until 1884, since which time they h
been increasing "and have been mostly continuous during the past two yea
Similarly, until 1874, the Littleborough District, although supplied by

Rochdale Corporation, was supplied with a different water to that now in use—the former being "a very hard water . . . pumped up from Dearnley "Colliery which was rented by the Rochdale Corporation." And it is reported that up to that time (1874) there was no lead poisoning in the district, neither was any observed until 1878 or 1880; that is, until the present supply had been from four to six years in use—"the pipes apparently "being protected up to that time."

In both these districts the lead poisoning is reported as being most common in the summer and autumn.

As regards the source of the Rochdale water, it appears that it is obtained from three separate moorland gathering grounds, said to be generally similar in character, and situated respectively in the townships of Spotland, Wuerdle and Wardle, and Wardleworth. The water from the Wuerdle and Wardle gathering ground is collected in two reservoirs named Wham and Hamer Pasture, and that from the Spotland gathering ground in two reservoirs named Spring Mill and Cowm. A fifth, "Buckley Wood" reservoir, receives water from "any of the preceding reservoirs," and, apparently, also the water from the Wardleworth gathering ground.

As regards the distribution of these different waters among the several districts supplied by Rochdale, the medical officer of health informs me that "the supply is furnished sometimes from one reservoir, sometimes from "another, and sometimes mixed."

The water in the Cowm reservoir is filtered, the other waters apparently are not filtered.

The Medical Officer of Health to the Littleborough District states that he has examined the water from the Hamer Pasture reservoir (Wuerdle and Wardle gathering ground), with which, he is informed, the Littleborough District is chiefly supplied, and that he finds it has a decidedly acid reaction; whereas he understands that the water from the Cowm reservoir (Spotland gathering ground) is alkaline. To this difference he is inclined to attribute the greater amount of lead poisoning in his district than in some other districts supplied by the Rochdale Corporation.

Appx. A. No. 28.

On the Causes of Lead Poisoning, by Mr. Tomlinson.

Sources of the Water Supplies possessed by Corporate Boroughs in [illegible] delivered or otherwise treated by the Water Authority and [illegible] together with Data from each Sanitary Area as to the [illegible] ment of Lead Poisoning in connection therewith.

Name of County Borough Water Supply.	Districts supplied.	Estimated Population receiving the Water.	Source
1.	2.	3.	4.
Barrow-in-Furness Corporation Waterworks.	Barrow-in-Furness, County Borough.	52,712	Moorland ground [illegible] from B
	Dalton-in-Furness, U.S.D.	12,300	
		65,012	
Blackburn Corporation Waterworks.	Blackburn, County Borough.	119,364	Moorland ground [illegible] of Dow Riding 20 miles burn.
	Blackburn, R.S.D. (part)	2,500	
		121,864	
Bolton Corporation Waterworks.	Bolton, County Borough	115,002	
	Aspull, U.S.D. (part) -	5,055	
	Astley Bridge, U.S.D.	6,139	
	Atherton, U.S.D. (part)	150	
	Farnworth, U.S.D. -	23,756	Moorland ground, Sharples and Par 3 to 7 Bolton.
	Hindley, U.S.D. -	14,973	
	Kearsley, U.S.D. -	7,900	
	Leigh, U.S.D. - -	28,702	
	Little Hulton, U.S.D.	6,697	
	Turton, U.S.D. - -	4,766	
	Westhoughton, U.S.D. -	10,100	
	Barton-upon-Irwell, R.S.D. (part).	8,500	
	Bolton R. S. D. -	27,136	
		265,878	

[LANCASHIRE.]

the Source or Sources of each such Supply, whether or not the Water is in any Case Sanitary Districts in each instance supplied from the Borough Waterworks; delivery to Consumers of the Water Supply, and Facts as to occurrence or

Whether Filtered or Treated.	Whether Lead Service Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among Consumers according to Reports of Medical Officers of Health.
5.	6.	7.	8.
"Partially"	"To some extent."	No	None heard of.
	No	No	None heard of.
No	Yes, but tinned	Seldom for drinking water.	"None, except what is clearly due to trade." The water said to have a slightly alkaline reaction.
	Yes	—	None heard of.
	Yes, but tinned	Not stated	None heard of.
	Yes, but tinned	No	"Cases of lead poisoning very few." Two or three cases in the past due to drinking the water first thing in the morning. (About one-tenth of the population of this district is supplied by the Blackrod Local Board Waterworks.)
	Yes, but tinned	No	None heard of.
	Yes, but tinned	Not stated	None heard of as due to water supply. A few cases of plumbers' colic.
Yes, most is filtered through sand and gravel.	Yes	No	None heard of.
	Yes	No	None heard of since the use of this water. Previously cases did occur, but then lead-lined cisterns were used.
	Yes, but tinned	No	None heard of.
	Yes, but tinned	No	None heard of as due to drinking water. Two cases in past due to trade.
	Yes	No	None heard of as due to drinking water. Two cases in past due to trade.
	Yes	Very few	None heard of.
	Yes, but tinned	No	None heard of.
	Yes	No	None heard of.
	Yes	No	None heard of.

Name of County Borough Water Supply.	Districts supplied.	Estimated Population receiving the Water.	Source
1.	2.	3.	
Burnley Corporation Waterworks.	Burnley, County Borough.	87,058	Moorland ground Burnley carbonif stone, in boulder with dri
Bury Corporation Waterworks.	Bury, County Borough -	57,206	Moorland ground worth, and Cl 5, 10, from tively.
	Haslingden, U.S.D. -	17,000	
	Little Lever, U.S.D. -	5,168	
	Prestwich, U.S.D. (part)	3,934	
	Radcliffe, U.S.D. -	20,020	
	Ramsbottom, U.S.D. -	14,000	
	Rawtenstall, U.S.D. -	19,672	
	Whitefield, U.S.D. -	10,781	
	Bury, R.S.D. (part) -	12,000	
		159,781	
Liverpool Corporation Waterworks.	Liverpool City - -	517,951	Two-third and mo stone g Blackb ton, 25 Liverpo third fr new red The wat two s mixed livery in and app before most of districts.
	Bootle, County Borough	49,217	
	Abram, U.S.D. -	4,259	
	Allerton, U.S.D. -	914	
	Ashton-in-Makerfield, U.S.A.	46	
	Childwall, U.S.D. -	199	
	Chorley, U.S.D. -	23,082	
	Garston, U.S.D. -	13,444	
	Great Crosby, U.S.D. -	6,400	
	Haydock, U.S.D. -	6,509	
	Huyton-with-Roby, U.S.D.	4,625	
	Litherland, U.S.D. -	4,441	
	Ltttle Crosby, U.S.D. -	212	
	Little Woolton, U.S.D. -	1,131	
	Much Woolton, U.S.D.	4,545	
	Prescot, U.S.D. -	6,745	
	Toxteth Park, U.S.D. -	21,046	
	Walton-on-the-Hill, U.S.D.	40,304	
	Waterloo and Seaforth, U.S.D.	17,328	
	Wavertree, U.S.D. -	13,764	
	West Derby, U.S.D. -	30,000	
	West Derby, R.S.D. -	1,095	
		767,257	

* Since about the end of October 1891 some 3,000,000 gallons o Montgomeryshire. This water is mixed with well water and distribute

Whether Filtered or Treated.	Whether Lead Service Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among Consumers according to Reports of Medical Officers of Health.
5.	6.	7.	8.
No, only stored in reservoirs.	Yes	No	None heard of.
Rubble walls in brook course before entering reservoir.	Yes	Yes	None heard of.
	Yes	No	None heard of.
	Yes	Not stated	None heard of.
	Iron "as far as possible."	No	None heard of as due to water supply.
	Yes	No	None heard of.
	Yes, but tinned	Hardly any	None heard of as due to public water supply.
	Yes, but tinned	Very few	None heard of.
	Yes	No	None heard of as due to public water supply.
	Yes	Only a few	None heard of.
The water from the gathering ground is filtered through sand and gravel. The well water is not filtered.	Yes	Only a few	None heard of as due to water supply.
	Yes	Only a few	None heard of.
	Yes, but most tinned.	No	None heard of.
	Yes	None known of	None heard of.
	Only a few	No	None heard of.
	Yes	Yes, a few	None heard of.
	Yes	Very few, if any.	None heard of as due to water supply.
	Yes	None known of	None heard of.
	Yes	A few	None heard of.
	Only a few	No	None heard of.
	Yes	No	None heard of.
	Yes	A few lead-lined.	None heard of.
	Yes	Yes	None heard of.
	Yes	No	None heard of.
	Yes	No	None heard of.
	Yes	No	None heard of.
	Yes	A few	None heard of.
	Yes	A few	None heard of.
	Yes	Yes	None heard of.
	Yes	Very few	Only one case heard of in connexion with water supply (13 years ago) due to storage of water in leaden cistern.
	Yes	Not many	None heard of as due to water supply.
	Yes	"Few, or none"	None heard of.

day have also been received by the Liverpool Corporation from Vyrnwy Lake, in city but it forms only one seventh of the total supplies. It is filtered.

Name of County Borough Water Supply.	Districts supplied.	Estimated Population receiving the Water.	Soure
1.	2.	3.	
Manchester Corporation Waterworks.	Manchester, City -	505,343	
	Salford, County Borough	198,136	
	Stockport, County Borough.	23,419	
	Atherton, U.S.D. -	15,683	
	Barton Eccles, Winton, and Monton, U.S.D.	29,606	
	Crumpsall, U.S.D.* -	—	
	Denton and Haughton, U.S.D.	13,793	
	Droyleden, U.S.D -	9,482	
	Failsworth, U.S.D. (part)	425	
	Gorton, U.SD. - -	15,162	
	Heaton Norris, U.S.D. -	7,164	Gatheri in th Long head, Manc moorl the A sm is un
	Levenshulme, U.S.D. -	5,506	
	Moss-side, U.S.D. -	23,833	
	Newton Heath, U.S.D.*	—	
	Openshaw, U.S.D.* -	—	
	Prestwich, U.S.D. -	3,935	
	Reddish, U.S.D. -	6,854	
	Stretford, U.S.D. -	21,751	
	Swinton and Pendlebury, U.S.D.	20,197	
	Tyldesley - with - Shakerley, U.S.D.	12,801	
	Withington, U.S.D. -	25,629	
	Barton - upon - Irwell, R.S.D.	17,500	
	Prestwich, R.S.D. -	14,705	
		970,924	

* Crumpsall, Newton Heath, and Openshaw Urban Sanitary [illegible] that of Manchester above.

[Lancashire]—*continued.*

Whether Filtered or Treated.	Whether Lead Service Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among Consumers according to Reports of Medical Officers of Health.
5.	6.	7.	8.
	Yes, short ones	No	None heard of as due to this supply.
	Yes, but tinned	Few, if any	None heard of.
	Yes	Seldom for drinking water.	Only one case heard of in 15 years.
	Yes, but tinned	Not stated	None heard of as due to water supply. Only a few cases of plumbers' colic.
	Yes	Some lead-lined	None heard of.
	Yes	No	None heard of as due to water supply.
	Yes	No	None heard of.
	Yes	No	None heard of.
	Yes	No	None heard of as due to water supply.
	Yes	No	None heard of in Gorton, but M.O.H. reports one case met with in another district in connexion with Manchester water.
The water is not filtered, but is passed through wire strainers of 30 strands to the inch.	Yes	No	None heard of.
	Yes	Yes	None heard of
	Yes, short ones	No	None heard of as due to water supply.
	None known of	None known of	None heard of.
	Yes	Not stated	None heard of.
	Iron, "as far as possible."	No	None heard of as due to water supply.
	Yes	No	None heard of.
	Yes	No	None heard of.
	Yes	Yes	"Very few cases having come under my observation either in public or private practice, I can give no approximate estimate. Few, if any complaints have been referred to me for investigation."
	Yes, but tinned	Not stated	None heard of.
	Yes	None known of	None heard of.
	Yes	No	None heard of.
	Yes	None known of	None heard of.

recently been added to the city of Manchester. Their population is included in

Name of County Borough Water Supply.	Districts supplied.	Estimated Population receiving the Water.	Source
1.	2.	3.	
Oldham Corporation Waterworks.	Oldham, County Borough	131,463	Moorlan ground dale, Denshe seven, from (tively.
	Chadderton, U.S.D. -	21,687	
	Crompton, U.S.D. -	12,851	
	Failsworth, U.S.D. -	10,000	
	Lees, U.S.D. - -	3,872	
	Royton, U.S.D. -	13,895	
	Ashton-under-Lyne, R.S.D. (part).	900	
	Quickmere, U.S.D.* -	2,670	
		196,838	
Preston Corporation Waterworks.	Preston, County Borough	107,573	1. Moorlan ground s 20 miles
	Longridge, U.S.D. -	3,500	2. High ground, ridge.
Rochdale Corporation Waterworks.	Rochdale, County Borough	68,458	Three sep land grounds land, W Wardle, dleworth tively, a few mile dale. T districts the Roc poration with wat times reservoir times fro and mixed."
	Castleton-by-Rochdale, U.S.D.	4,220	

* In West Riding of Yorkshire. I

[LANCASHIRE]—*continued.*

Whether Filtered or Treated.	Whether Lead Service Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among Consumers according to Reports of Medical Officers of Health.
5.	6.	7.	8.
No	Yes, but many are tinned.	Very few	Very little observed lead poisoning as due to water supply, though the water acts to some extent on lead.
	Yes	Not for drinking purposes.	None heard of as due to water supply.
	Yes, but new ones are tin-lined.	Very few, if any	None heard of.
	Yes	No	None heard of as due to water supply.
	Yes, but generally tin-lined.	Not for domestic supply.	None heard of.
	Yes, but tinned	Not for domestic supply.	None heard of.
	Yes, but tinned	None known of	None heard of.
	Yes	No	None.
Not filtered. Screened. (60 meshes to square inch.)	Yes	No	Almost unheard of in the past. None known of at present.
	No	No	None heard of.
Some of the Spotland water is filtered through sand. Water from other gathering grounds apparently not filtered.	Yes	Yes	Some cases in the past and some at present, "but cannot give any idea of their number." "The cases I have seen have arisen in plumbers and painters, also in houses where the pipe is lead, and some distance from the iron mains."
	Yes	No	None heard of as due to the public water supply.

taken from Dr. Barry's Return.

Name of County Borough Water Supply.	Districts supplied.	Estimated Population receiving the Water	Source
1.	2.	3.	
Rochdale Corporation Waterworks—*cont.*	Littleborough, U.S.D. -	9,000	Three se land ground land, W Wardle dlewor tively, few m dale. district the R poratio with v times reserv times and mixed.
	Middleton, U.S.D. -	Relief supply from Rochdale but seldom used.	
	Milnrow, U.S.D. -	5,364	
	Whitworth, U.S.D. -	4,883	
	Wuerdle and Wardle, U.S.D.	3,902	
		95,827	
St. Helens Corporation Waterworks.	St. Helens, County Borough.	71,188	Wells in sandsto
	Ormskirk, R.S.D. (part)	120	
	Prescot, R.S.D. (part) -	900	
	West Derby, R. S. D. (part).	115	
		72,323	
Wigan Corporation Waterworks	Wigan, County Borough	55,013	Gathering Harrock from Wi and grazi

Whether Filtered or Treated.	Whether Lead Service Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among Consumers according to Reports of Medical Officers of Health.
5.	6.	7.	8.
Some of the Spotland water is filtered through sand. Water from other gathering grounds apparently not filtered.	Yes	Not for drinking water.	Cases of lead poisoning observed continuously since about 1878 or 1880, and they have been increasing the last three years. "There have been 40 or 50 fresh cases medically attended during the last two months. . . . There are generally more cases of lead poisoning in the summer and autumn than in the winter." Littleborough is said to be supplied mainly from Hamer Pasture reservoir (Wuerdle and Wardle gathering ground).
	Yes	Not for domestic use.	None known definitely about.
	Yes, short ones	No	None heard of.
	Yes	Yes	Lead poisoning "exceedingly common" years ago when the Rochdale Corporation water was first used in this district. It is now rare and diminishing.
	Yes	Only in about 10 houses.	Only a few cases prior to 1884; since then the number has increased. "Mostly continuous during the past two years, but more notably from July to October during that time." "I should say that about 50 cases have come under observation during the past 12 months."
	Yes	Very few	None heard of.
No	Yes	No	None heard of.
	Yes	None known of	None heard of.
	Yes	Few or none	None heard of.
Yes, filtered through sand.	Yes	No	None heard of.

App. A. No. 13.

On the Causes of Lead Poisoning; by Mr. Power.

As regards the 14 water supplies provided by Water Companies
Trusts, shown in Table V.A., little need at the present stag
Most of these waters are derived from upland gathering grounds;
again, as in the case of the county borough supplies, it would a
with one exception (the Rossendale Company's supply) there has be
spicuous lead poisoning among the consumers, at all events dur
years, though there is evidence that certain of the waters do to s
act, or have in the past acted, upon lead pipes and cisterns. The
Water Company's supply, however, apparently, as a rule, acts more
upon lead than the others now under consideration, and in the spri
a considerable outbreak of plumbism is reported to have occurred a
association with this water supply. The somewhat sudden incre
amount of lead poisoning observed at this time might, it has been

TABL

NOTING with reference to WATER COMPANIES (and WATER T
whether or not the Water is Filtered or otherwise "Treated"
Supply; together with Data for each Sanitary Area as to circu
or not of Lead Poisoning in connexion therewith.

Name of Water Company.	Districts supplied.	Estimated Population receiving the Water.	Source of
1.	2.	3.	4.
Accrington Gas and Water Company.	Accrington, U.S.D. -	38,603	Gathering parly moo DeanClou 4 miles f
	Church, U.S.D. -	4,870	crington;
	Clayton-le-Moors, U.S.D.	7,155	Booths, 3 r
	Great Harwood, U.S.D.	9,073	Accringtor
	Rishton, U.S.D. -	6,010	Huncoat, h
	Burnley, R.S.D. -	500	from Accri
		66,211	
Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Waterworks Joint Committee.	Ashton-under-Lyne, U.S.D.	40,494	
	Audenshaw, U.S.D. -	6,547	High gat
	Hurst, U.S.D. - -	6,772	grounds a
			shaw, 2½ m
	Mossley, U.S.D. -	14,162	Ashton-und
			and Green
	Stalybridge, U.S.D. -	26,783	miles distan
	Ashton-under-Lyne, R.S.D. (part).	7,050	
		101,808	
Carnforth Waterworks Company.	Carnforth and Warton in the Lancaster R.S.D.	2,000	Gathering gr Swarthdale distant.
Colne Water Estate Company.	Colne and Marsden U.S.D. (part).	1,325	Hill sides -

* Herein are included two minor sources in private

have had some relation to the fact of the water mains having stood empty for a period of six weeks during the previcus summer. This water is obtained entirely from moorland gathering grounds, and is stated by Dr. Brown, the Medical Officer of Health to the Bacup Urban Sanitary District, to have an acid reaction. It is not filtered, but in 1888, at the suggestion of Dr. Brown, lime (CaO) was placed across the conduit so that all the water going to the reservoir was charged with Ca $(HO)_2$, which was held in solution. This, however, was discontinued, as the plumbo-solvent action of the water increased.

A few cases of lead poisoning in the past, and one recent case, are reported from districts supplied by the Fylde Company's water; also a few cases are said to have occurred 30 years ago in a district supplied by the Tintwistle Waterworks Company, and one or two cases elsewhere.

[LANCASHIRE.]

in the County of Lancaster, the Source or Sources of each such Supply, Water Authority, and the several Districts in each instance obtaining the of delivery to Consumers of the Water Supply and Facts as to occurrence

Whether Filtered or otherwise Treated.	Whether Lead Service Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among Consumers of the Water according to the Information received from the Medical Officers of Health to the Districts supplied.
5.	6.	7.	8.
In all cases there is provision for settling before admission to the service reservoir.	Yes	No	None heard of, but the water "is capable of taking up lead if long exposed to its action."
The Huncoat water is filtered through sand, gravel, coke, and bricks.	Yes	No	None heard of.
	Yes	No	None heard of.
	Yes	No	None heard of.
	Yes	No	None heard of.
	Yes	No	None heard of.
No	Yes, but many are tin-lined.	Yes	None heard of.
	Yes	No	None heard of.
	Yes, but some tin-lined.	No	None heard of.
	Yes, but tin-lined.	Not many	Only two cases heard of in 15 years. None at present.
	Yes	—	None heard of.
	Yes, but some are tin-lined.	No	None heard of.
No	Some, but chiefly iron.	—	None heard of.
No	Yes	Very few	None heard of.

both of them delivered to Colne and Marsden U.S.D.

Name of Water Company.	Districts supplied.	Estimated Population receiving the Water.	Source of W
1.	2.	3.	4.
Fylde Water-works Company, The.	Blackpool, U.S.D. -	23,596	Grizendale miles from The Fylde
	Fleetwood, U.S.D. -	9,274	
	Kirkham, U.S.D. -	3,889	
	Lytham, U.S.D. -	4,636	
	St. Anne's, U.S.D. -	2,538	
	The Fylde, R.S.D. -	6,110	
	Garstang, R.S.D. -	3,250	
		53,293	
London and North-Western Railway Company's Supply.	Newton-in-Makerfield, U.S.D.	12,000	Deep bore-ho red sandsto
Monteliffe Colliery Supply.	Horwich, U.S.D. -	200 supplied with this water alone; 12,500 with this and Blackrod Local Board water mixed.	- -
Rossendale Water-works Company.	Bacup, U.S.D. - -	4,240	Moorland ground wi Bacup U.S.
Mr. Ormerod's supply.	Colne and Marsden, U.S.D.	100	Agricultural la Colne.

Whether Filtered or otherwise Treated.	Whether Lead Service Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among Consumers of the Water according to the Information received from the Medical Officers of Health to the Districts supplied.
5.	6.	7.	8.
Passed through fine sieves having 10,000 apertures to the square inch.	Yes	Not for domestic use.	Rare cases occasionally in the past; practically none. One case recently in new house attributed to new lead service pipe.
	Yes	Not for domestic use.	None heard of.
	Yes	Not for domestic use.	None heard of as due to water supply.
	Yes	Apparently not now.	In the past very few cases. Unprotected lead cisterns once the cause, but now done away with. No lead poisoning at present.
	Yes	Not for domestic use.	None heard of.
	Yes	Not for domestic use.	None heard of as due to the Company's water.
	Yes	Very few	None traced to The Fylde Company's water.
No - - -	Yes	Yes	None heard of.
No - - -	Yes, but tin-lined.	No	None heard of.
Not filtered, but passed through settling wells.	Yes, short lengths.	Not for drinking purposes.	In the spring of 1888, there was a considerable outbreak of plumbism, which "was associated with the public water supply." This followed upon a water famine in the previous year, when the pipes were empty for six weeks. "But there were cases of lead palsy due to public water supply for many years past." On the whole, however, it seems to be diminishing, and at present there are only a few cases.
Apparently not -	Yes - -	Very few -	None heard of.

APP. A. No. 13.

On the Causes of Lead Poisoning; by Mr. Power.

Name of Water Company.	Districts supplied.	Estimated Population receiving the Water.	Source
1.	2.	3.	
Southport Water-works Company.	Southport, U.S.D. -	43,026	Wells in sandst
	Birkdale, U.S.D. -	12,387	
	Ormskirk, R.S.D. -	9,600	
		65,013	
Stockport District Water-works Company.	Stockport, B. - -	1. 46,834	1. Gather chiefly Lyme, Stockpo
		2. *See* Manchester.	2. Gather chiefly Woodhe chester Water), miles port. drought hole" and a Edgley The La tion o Borough Districts Norris are su the Water.
	Heaton Norris, U.S.D. - Reddish, U.S.D. -	*See* Manchester.	
Mr. R. Sugar's supply.	Colne and Marsden, U.S.D.	218	Hill side, n
Tintwistle Water-works Company.	Ashton-under-Lyne, R.S.D. (part) (3rd district).	3,450	Moorland miles fr tion supp
Trawden Water Company.	Trawden, U.S.D. -	1,800	"From t one on e the town. "Gathering is suppos the immed of the spr "Sand and

[LANCASHIRE]—*continued.*

Whether Filtered or otherwise Treated.	Whether Lead Service Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among Consumers of the Water according to the Information received from the Medical Officers of Health to the Districts supplied.
5.	6.	7.	8.
No - -	Yes	No	None heard of.
	Yes	Yes	None heard of.
	Yes	No	None heard of.
1. Yes, filtered through sand. 2. Not filtered, but strained (*see* Manchester).	Yes	Not often for drinking purposes.	Only one case heard of in 15 years. In this case the water was stored in a lead cistern.
No - -	Yes	Very few	None heard of.
Settling tanks; no filtration.	Some	No	History of lead poisoning at some few houses where lead service pipes were in use about 30 years since. This property has since been supplied with iron pipes. No lead poisoning at present.
No - -	Some lead, some iron.	No	None heard of. The water said to act slightly on lead.

Of the 22 water supplies possessed by urban sanitary authorities county boroughs (Table VI.A.), there is little to record as poisoning. Two or three cases are reported as having, in the past the Aspull Urban Sanitary District, which obtains some of its wa Blackrod Local Board Waterworks. Aspull, however, obtains most from the Bolton Corporation Waterworks, and it is not stated to the cases were apparently due. In the other five districts to which Local Board water is also supplied, no lead poisoning has been o connexion with the Darwen Corporation water, there has evider appreciable amount of lead poisoning in the past, though it ap have diminished. The medical officer reports as follows:—"C " poisoning having occurred for some years past in the district " water were sent about two years ago to Dr. Frankland, who r " a quantity of soda to be put into the water. This was done " not heard of a case of lead poisoning since." The Darwen wat from hills near the borough.

From the Skelmersdale Urban Sanitary District "several cases " and two well-marked cases with palsy," evidently considered by Officer of Health to have been due to the public water supply pro Skelmersdale Local Board, are reported. The Medical Officer of that he "recommended the local board to take up the long leng " pipes, which was carried out." The lead poisoning, he states, is This water is obtained from an artesian well in the red sandstone filtered.

TA

NOTING the Water Supplies possessed by URBAN SANITARY such Supply, whether or not the Water is Filtered or otherwise obtaining the Supply; together with Data for each Sanitary to the occurrence or not of Lead Poisoning in connexion there

Name of Urban Sanitary District Water Supply.	Districts supplied.	Estimated Population receiving the Water.	Source of t
1.	2.	3.	4
Ashton in-Makerfield Local Board Waterworks.	Ashton-in-Makerfield, U.S.D.	10,800	Gathering agricultura within the partly fro township o ley.
Billinge Local Board Waterworks.	Billinge, U.S.D.	3,866	Disused qua ings.

One case, and one only, of lead poisoning is mentioned as having come under bservation in the Widnes Urban Sanitary District. This district is supplied ith water from deep wells by the Widnes Local Board Waterworks.

With the possible exceptions above referred to, there is no evidence of lead oisoning, either in the past or at present, in connexion with the public water applies possessed by any of the 22 urban sanitary authorities. The waters are btained from various sources, but the majority are from upland gathering rounds, and several of such waters are not filtered or otherwise treated. It ill be observed that the Heywood Corporation water is obtained from a gather-ng ground at Nayden Dean, in the township of Spotland, in which township ne of the gathering grounds of the Rochdale Corporation water is also situated. he Heywood water is supplied to over 47,000 persons in six sanitary districts, nd it seems evident that no conspicuous lead poisoning has occurred as a result f its use. In one of these five districts, Castleton-by-Rochdale, some cases ave been met with, but they do not appear to have been attributed to public ater supply. From another district, Middleton, it is stated that no cases re known "definitely about," a remark which would seem to imply a suspicion hat cases have occurred. It will be noted, however, that the former of these istricts is almost entirely supplied by the Rochdale Corporation, only about 20 persons receiving the Heywood supply, and that the latter, although ainly supplied with the Heywood Corporation water, yet has a relief supply rom Rochdale.

[Lancashire.]

(other than County Boroughs) of Lancashire, the Source or Sources of each the Water Authority, and the several Sanitary Districts in each instance circumstances of delivery to Consumers of the Water Supply, and Facts as

Whether Filtered or otherwise Treated.	Whether Lead Service Pipes are in use.	Whether Lead Cisterns are in use.	Presence or absence of Lead Poisoning among Consumers according to Information supplied by the Medical Officers of Health.
5.	6.	7.	8.
Yes. Filtered through sand and gravel.	Only a few, and those tinned.	None known of	None heard of.
Yes. Filtered through broken stones and sand, &c.	No	No	None heard of.

Name of Urban Sanitary District Water Supply.	Districts supplied.	Estimated Population receiving the Water.	Source
1.	2.	3.	
Blackrod Local Board Waterworks.	Blackrod, U.S.D. -	4,021	Gather Rivin three
	Adlington, U.S.D. -	4,190	
	Aspull, U.S.D. (part) -	897	
	Horwich, U.S.D. -	12,500*	
	Chorley, R.S.D. (part) -	150	
	Wigan, R.S.D. (part) -	1,186	
		22,944	
Clitheroe Corporation Waterworks.	Clitheroe, U.S.D. -	10,600	Grit Fells of no boundar Valley, from Cl
Colne and Marsden Local Board Waterworks.	Colne and Marsden, U.S.D.	15,131	Moorlands in distri
Darwen Corporation Waterworks.	Darwen, U.S.D. -	32,692	Hills near
Fulwood Local Board Water-Works.	Fulwood, U.S.D. -	4,006	Beacon F from F
	Preston, R.S.D. (part) -	600	
		4,606	
Grange Local Board Waterworks.	Grange, U.S.D. - -	1,633	Newton F distant.
	Kendal, R.S.D. (part) -	400	
		2,033	

* Supplied with F

ether Filtered or ierwise Treated.	Whether Lead Service Pipes are in use.	Whether Lead Cisterns are in use.	Presence or absence of Lead Poisoning among Consumers according to Information supplied by the Medical Officers of Health.
5.	6.	7.	8.
	Yes, but tinned	- - -	None heard of.
	A few	A few	None heard of.
	Yes, but tinned	No	"Cases of lead poisoning are very few." Two or three cases have been observed in the past, and "each case was traced to the habit of drinking from the tap immediately on rising in the morning before going to work." It is not stated whether these were persons using the Blackrod or Bolton water.
	Yes, but tinned	No	None heard of.
	No	No	None heard of.
	Yes, but tinned	- - -	None heard of.
- - -	Yes, but tinned	No	None heard of.
- - -	Yes	Very few	None heard of.
ering beds just ompleted. The ater is also eated with soda.	Yes	- - -	Cases of lead poisoning have occurred for some years past, but have not been observed since treatment of the water with soda was adopted.
- -	Yes	No	None heard of.
	Yes	None known of	None heard of.
- -	No	No	None heard of.
	No	Very few	None heard of.

itcliffe Colliery water mixed.

Name of Urban Sanitary District Water Supply.	Districts supplied.	Estimated Population receiving the Water.	Sou
1.	2.	3.	
Heywood Corporation Waterworks.	Heywood, U.S.D. -	23,286	Gath N th Sp R 5 w
	Castleton-by-Rochdale (part).	120	
	Chadderton, U.S.D. -	200	
	Middleton, U.S.D. -	21,110	
	Norden, U.S.D. -	2,400	
	Prestwich, R.S.D. -	795	
		47,911	
Ince Local Board Waterworks.	Ince-in-Makerfield, U.S.D.	19,255	Well sto
	Leigh, R.S.D. - -	5,000	
		24,255	
Lancaster Corporation Waterworks.	Lancaster, U.S.D. -	31,038	Gath Ov mil
	Morecambe, U.S.D. -	6,476	
	Lancaster, R.S.D. (part)	3,200	
		40,714	
Leyland Local Board Waterworks.	Leyland, U.S.D. -	4,500	Deep
Nelson Corporation Waterworks.	Nelson, U.S.D. - -	22,700	Two ing Col Spr 4½
	Brierfield, U.S.D. -	5,838	
	Burnley, R.S.D. (part) -	3,000	
		31,538	
Ormskirk Local Board Waterworks.	Ormskirk, U.S.D. -	6,298	Pump sand
	Lathom, U.S.D. -	55	
	Ormskirk, R.S.D. (part)	475	
		6,828	
Oswaldtwistle Local Board Waterworks.	Oswaldtwistle, U.S.D. -	13,296	Gather the
	Church, U.S.D. (part) -	1,000	the

[Lancashire]—*continued.*

Whether Filtered or otherwise Treated.	Whether Lead Service Pipes are in use.	Whether Lead Cisterns are in use.	Presence or absence of Lead Poisoning among Consumers according to Information supplied by the Medical Officers of Health.
5.	6.	7.	8.
Yes, filtered through broken stone and sand.	Yes	Yes	None heard of.
	Yes	No	None heard of as due to water supply.
	Yes	Not for drinking purposes.	None heard of as due to water.
	Yes	Not for domestic use.	"No cases known definitely about."
	Yes	No	None heard of.
	Yes	None known of	None heard of.
No - - -	Yes, some	No	None heard of.
	About 15 per cent. lead, the rest iron.	No	None heard of.
No - - -	Yes	Yes	None heard of.
	Yes	Not for drinking purposes.	None heard of.
	Some, but chiefly iron.	- - -	None heard of.
No - - -	Yes, but tin-lined.	- - -	None heard of.
No - - -	Yes	No	None heard of. (The water said not to act on lead.)
	Yes	No	None heard of.
	Yes	No	None heard of.
No - - -	Yes	Some	None heard of.
	Yes	No	None heard of.
	Yes	No	None heard of.
No - - -	Yes	No	None heard of.
	Yes	No	None heard of.

TABL

Name of Urban Sanitary District Water Supply.	Districts supplied.	Estimated Population receiving the Water.	Source of the
1.	2.	3.	4.
Padiham and Hapton Local Board Waterworks.	Padiham and Hapton, U.S.D.	11,311	Gathering gro Pendle Hill, a miles from P
Pemberton Local Board Waterworks.	Pemberton, U.S.D. -	18,000	Old quarri Billinge a holland.
	Orrell, U.S.D. - -	4,914	
		22,914	
Skelmersdale Local Board Waterworks.	Skelmersdale, U.S.D. -	6,627	Well in the re stone.
	Lathom, U.S.D. (part) -	150	
	Ormskirk, R.S.D. (part)	175	
		6,952	
Ulverstone Local Board Waterworks.	Ulverstone, U.S.D. -	9,848	Moorland ga ground at P ton Moor, distant.
	Ulverstone, R.S.D. -	300	
		10,148	
Walton-le-Dale Local Board Waterworks.	Walton-le-Dale, U.S.D.	9,070	Deep well -
	Chorley, R.S.D. (part) -	140	
	Preston, R.S.D. (part) -	200	
		9,410	
Warrington Corporation Waterworks.	Warrington, U.S.D. -	52,742	Wells in the re stone.
	Warrington, R.S.D. (part).	1,900	
		54,642	
Widnes Local Board Waterworks.	Widnes, U.S.D. -	29,911	Deep wells -
	Prescot, R.S.D. -	1,250	
		31,161	

ASHIRE]—*continued.*

er Filtered or wise Treated.	Whether Lead Service Pipes are in use.	Whether Lead Cisterns are in use.	Presence or absence of Lead Poisoning among Consumers according to Information supplied by the Medical Officers of Health.
5.	6.	7.	8.
ed - -	Yes	No	None heard of.
d through and gravel.	Yes, but tin-lined.	Not stated	None heard of.
	Yes, but tin-lined.	No	None heard of.
- -	Yes	No	"There were several cases of lead colic and two well-marked cases with palsy. . . . Recommended the Local Board to take up the long lengths of lead-pipes which was carried out." Lead poisoning diminishing.
	Yes	No	None heard of.
	Yes	No	None heard of.
tered, passed ugh copper ens.	No	Yes, in many cases.	None heard of.
	No	No	None heard of.
- -	Yes	No	None heard of in the township.
	No	No	None heard of.
	Yes	None known of	None heard of.
- -	Yes	Not for drinking purposes.	None heard of.
	No	No	None heard of.
- -	Yes	Yes	Only one case heard of in the last 10 years.
	Yes	None known of	None heard of.

Table VII.A., relating to the water supplies po

NOTING the Water Supplies possessed by, or provided for, Ru
such Supply, whether or not the Waters are Filtered befo
together with Data for each such Place or Locality as to
Lead Poisoning in connexion therewith.

Name of Rural Sanitary District Public Water Supplies.	Localities supplied.	Estimated Population receiving the Water.	Sou
1.	2.	3.	
Burnley, R.S.D.:			
a. Haggate supply.	Haggate village -	1,000	Moorl
b. Hapton supply.	Hapton village - -	2,000	tank
c. Cliviger supply.	Cliviger village -	600	supp
		3,600	
Clitheroe, R.S.D.:			
a. Whalley supply.	Whalley - -	700	
b. Sabden supply.	Sabden - - -	600	
c. Downham and Chatburn supply.	Chatburn and Downham	600	Hill g
d. Pendleton -	Pendleton - -	100	
		2,000	
Lunesdale, R.S.D.:			
a. Wray water scheme.	Wray and Hornby -	365	Hill gath
b. Caton water scheme.	Caton and Brookhouse -	820	Springs
c. Halton water scheme.	Halton - - -	250	Surface
		1,435	
Prescot, R.S.D.:			
a. Rainhill supply.	Rainhill and part of Whiston.	4,235	Wells in
b. Hale supply	Hale - - -	571	sandst
		4,806	
Preston, R.S.D.:			
Messrs. Bashall's supply.	Farrington - -	1,156	Well -

[The aggregate population shown in column 3 of Tables IV.A, V
persons owing to the fact that the first-named tables, in which wate
400 persons in the Kendal R.S.D. (Westmorland) who obtain the
whereas Tables I.A, II.A, and III.A, in which sanitary districts are
Lancashire.]

d for, rural sanitary authorities seem to require no comment.

CASHIRE.]

ORITIES, in the County of Lancaster, the Source of Sources of each wnships, Localities, or Places in each instance obtaining the Supply; very to Consumers of the Water, and Facts as to occurrence or not of

ıer Filtered or wise Treated.	Whether Lead Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among the Consumers according to Information supplied by the Medical Officers of Health.
5.	6.	7.	8.
- -	- - -	- - -	None heard of.
- -	Yes, short lengths.	No	"Have only seen three cases of lead poisoning in 18 years; two were painters."
ed through rel. tered as a rule, sometimes. ated - -	Some; but tin-lined.	No	None heard of.
- -	Yes - -	None known of.	None heard of.
- -	Yes - -	None known of.	None heard of.

exceeds that given in column 5 of Tables I.A, II.A, and III.A, by 3,070 erning units, include 2,670 persons in the Quickmere U.S.D. (Yorkshire) and ıire sources (Oldham Corporation and Grange Local Board respectively); ıclude only sanitary districts situate wholly or partly in the county of

(2.) Cumberland.

Preliminary information having reference to water supp poisoning in connexion therewith, has been received from the rural sanitary districts in the county of Cumberland. These 2 an aggregate area of about 970,154 acres, and a population o persons.

Of the total population it is estimated that 174,091 persons, cent., obtain water from some public source, while the remai 34 per cent., are dependent upon private sources of supply.

A.—Water Supplies: Public and other.

In Table II.B.* will be found, with respect to the 14 districts in the county of Cumberland, the general data population; and also the estimated number of persons receiv a public service, and of those dependent upon private sou From this table it appears that of an aggregate population of 1 it is estimated that 145,089, or nearly 97 per cent., obtain th some public service, while the remaining 4,958, or rather over dependent upon private sources.

Table II.B. [Cumberland.]

Summary of Returns with respect to the Water Suppl Urban Sanitary Districts situate in the County of Cu

Name of Urban Sanitary District.	Area in Acres. (1881 Census Report.)	Population, 1881. (Preliminary Census Report, 1891.)	Population, 1891. (Preliminary Census Report, 1891.)	In Urban Dis having Pul Water Sup Estimate Populatio	
				Served from Public Source.	De en Pr So
1.	2.	3.	4.	5.	
Arlecdon and Frizington	3,251	6,489	5,596	5,500	
Carlisle	1,568	36,585	39,176	39,176	
Cleator Moor	2,947	10,420	9,464	9,464	
Cockermouth	2,425	5,353	5,464	5,464	
Egremont	2,743	6,049	6,243	6,243	
Harrington	2,359	3,019	3,535	3,475	
Holme Cultram	23,650	4,230	4,602	—	
Keswick	734	3,220	3,905	3,905	
Maryport	2,827	8,126	8,784	8,784	
Millom	1,313	6,228	8,895	8,895	
Penrith	7,587	9,268	8,981	8,981	
Whitehaven	679	19,295	18,044	18,044	
Wigton	775	3,948	3,836	3,836	
Workington	641	14,109	23,522	*23,322*	
Total	53,499	136,339	150,047	145,089	

In Table III.B. are given similar data for the nine districts, from which it will be found that out of an aggreg population of 115,576 persons, it is computed that only 29,002, of the whole, are at present supplied with water by any public se many as 86,574, or practically 75 per cent. of the whole, are s upon local sources of supplies.

* There being no county boroughs in the county of Cumberland there is Table I.B.

TABLE III.B. [CUMBERLAND.]

SUMMARY of RETURNS with respect to the Water Supply of the RURAL SANITARY DISTRICTS situate in the County of Cumberland.

Name of Rural Sanitary District.	Area in Acres. (1881 Census Report.)	Census Population, 1881.	Estimated Population, 1890.	In Rural Districts having Public Water Supply. Estimated Population		Population of Rural Districts wholly dependent on Private Sources of Supply.
				Served from Public Source.	Dependent on Private Sources.	
1.	2.	3.	4.	5.	6.	7.
Alston with Garrigill	36,968	4,621	4,188	*2,450*	*1,738*	—
Bootle - -	89,988	5,997	3,000	200	2,800	—
Brampton - -	97,705	10,565	10,500	3,100	7,400	—
Carlisle - -	67,596	16,378	16,378	900	*15,478*	—
Cockermouth -	163,528	26,782	29,445	13,200	16,245	—
Longtown - -	88,245	7,711	7,950	—	—	7,950
Penrith - -	180,674	13,974	12,750	2,300	10,450	—
Whitehaven - -	78,729	14,093	15,865	6,052	9,813	—
Wigton - -	113,222	15,262	15,500	800	14,700	—
Total -	916,655	115,383	115,576	29,002	78,624	—

B.—PUBLIC WATER SUPPLIES AND LEAD POISONING.

In Tables V.B.* to VII.B. will be found an analysis of the circumstances as regards source, delivery, and distribution of the public water supplies in the county of Cumberland; together with information as to the presence or absence of lead poisoning in connexion with such supplies.

The majority of the supplies distributed to urban sanitary districts (Tables V.B. and VI.B.) appear to be obtained directly from mountain gathering grounds, though three important ones are taken from rivers, and one from a lake. Of the three supplies from rivers, two, viz., the Carlisle Corporation supply, and the supply of the Trustees of the District and Harbour of Maryport, are filtered; but the Penrith Local Board Supply, from the River Eamont, is not at present filtered. The supplies provided for rural sanitary districts (Table VII.B.) are for the most part obtained from springs upon the neighbouring hills.

As regards lead poisoning the evidence from Cumberland is almost entirely negative. It will, however, be noted that for some or other reason, according to the information received, very few lead service pipes or cisterns are used in Cumberland.

The only cases of lead poisoning reported from Cumberland occurred in districts supplied by the Whitehaven Local Board Waterworks and the Wigton Local Board Waterworks. As regards the former district, the Medical Officer of Health says he is informed that "symptoms of lead poisoning occurred in "former years when lead cisterns were used, but these have now been disused "for many years, and I can get no reliable account of any cases of lead "poisoning due to water in recent years." The Whitehaven Local Board water is obtained from Ennerdale Lake. It is not filtered. Lead service pipes appear to be still in use in houses to which this water is distributed.

In the case of Wigton the Medical Officer of Health reports one case of colic in a painter, and one case of "wrist-drop" of some years' standing. The latter, however, he says, presents no other symptoms of lead poisoning, and no source of lead poisoning could be found—"the water used was free from lead."

* There being no county boroughs in the county of Cumberland there is no material for Table IV.B.

NOTING with reference to WATER COMPANY (or WATER T
water is Filtered or otherwise Treated by the Water Author
Sanitary Area as to circumstances of delivery to Consumers
therewith.

Name of Water Company or Trust.	Districts supplied.	Estimated Population receiving the Water.	Source o
1.	2.	3.	
Cockermouth and Workington Joint Waterworks Committee.	Cockermouth, U.S.D. -	5,464	Mountai ground moek from C
	Harrington, U.S.D. -	3,475	
	Workington, U.S.D. -	23,322	
	Cockermouth, R.S.D. (part).	8,000	
	Whitehaven, R.S.D. (part).	325	
		40,586	

T

NOTING the Water Supplies possessed by URBAN SANITATY DIS
or not the Water is Filtered or otherwise Treated by the Wat
together with Data for each Sanitary Area as to circumstance
Lead Poisoning in connexion therewith.

Name of Urban Sanitary District Water Supply.	Districts supplied.	Estimated Population receiving the Water.	Source
1.	2.	3.	
Arlecdon and Frizington Local Board Waterworks.	Arlecdon and Frizington, U.S.D.	5,500	Mountain ground Cogra miles di
	Egremont, U.S.D. -	6,243	
	Whitehaven, R.S.D. (part).	500	
		12,243	
Carlisle Corporation Waterworks.	Carlisle, U.S.D. -	39,176	The River
	Carlisle, R.S.D. -	900	
		40,076	

ty of Cumberland, the Source or Sources of Supply, whether or not the
al Sanitary Districts obtaining the Supply; together with Data for each
ly, and Facts as to occurrence or not of Lead Poisoning in connexion

er Filtered or wise Treated.	Whether Lead Service Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among Consumers of the Water according to Information received from the Medical Officers of Health to the Districts supplied.
5.	6.	7.	8.
	No	No	None heard of.
	Practically, no	No	None heard of.
	Yes	Yes?	None heard of, but the water said to have a powerful action on lead and iron.
	Practically, no	No	None heard of.
	No	Not as a rule	None heard of.

ty of Cumberland, the Source or Sources of each such Supply, whether
he several Sanitary Districts in each instance obtaining the Supply;
sumers of the Water Supply, and Facts as to the occurrence or not of

ıer Filtered or wise Treated.	Whether Lead Service Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among Consumers according to Information supplied by the Medical Officers of Health.
5.	6.	7.	8.
	No	No	None heard of.
	No	No	None heard of.
	A few	Not as a rule	None heard of.
filtered	Yes	No	None heard of.
ıgh boulders,			
les, gravel,	Yes	No	None heard of.
sand.			

Name of Urban Sanitary District Water Supply.	Districts supplied.	Estimated Population receiving the Water.	Source
1.	2.	3.	
Cleator Moor Local Board Waterworks.	Cleator Moor, U.S.D -	9,464	Hill gathe
	Whitehaven, R.S.D. (part).	1,417	from ¼ east of
		10,881	
Keswick Local Board Waterworks.	Keswick, U.S.D. -	3,905	Sides of
	Cockermouth, R.S.D. (part).	200	2 miles wick.
		4,105	
Trustees of the District and Harbour of Maryport.	Maryport, U.S.D. -	8,784	River Der
	Cockermouth, R.S.D. (part).	5,000	
		13,784	
Millom Local Board Waterworks.	Millom, U.S.D. - -	8,895	Hill gathe Black part of W about 6 Millom.
Penrith Local Board Waterworks.	Penrith, U.S.D. -	8,981	River Eamo
Whitehaven Local Board Waterworks.	Whitehaven, U.S.D. -	18,044	Ennerdale miles dis
	Whitehaven, R.S.D. (part).	2,210	
		20,254	
Wigton Local Board Waterworks.	Wigton, U.S.D. -	3,836	Spring on stone Hill from Wigt

MBERLAND]—*continued.*

ether Filtered or erwise Treated.	Whether Lead Service Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among Consumers according to Information supplied by the Medical Officers of Health.
5.	6.	7.	8.
, filtered rough gravel d sand.	No, except in a few instances.	No	None heard of.
	A few, mostly galvanised iron.	Not as a rule	None heard of.
- -	No	No	None heard of.
	Practically, no	No	None heard of.
ered through avel.	No	No	None heard of.
	Practically, no	No	None heard of.
- -	No	No	None heard of.
- -	No	No	None heard of.
- -	Yes	Very few	None heard of in recent years, but said to have occurred "in former years" when lead cisterns were used.
	Only a few	Not as a rule	None heard of.
- -	Very few	No	Apparently none heard of as due to water supply.

App. A. No. 13.

On the Causes of Lead Poisoning; by Mr. Power.

NOTING the Water Supplies possessed by or provided for Ru
Supply, whether or not the Waters are Filtered or otherwi
the Supply; together with Data for each such Place
occurrence or not of Lead Poisoning in connexion therew

Name of Rural Sanitary District Water Supply.	Districts supplied.	Estimated Population receiving the Water.	Sc
1.	2.	3.	
Alston-with-Garrigill, R.S.D.:			
a. Alston supply.	Alston - - -	1,050	"Spri
b. Nenthead supply (East).	Nenthead (part) -	600	
c. Nenthead supply (West).	Nenthead (part) -	400	All fel
d. Garrigill supply (1).	Garrigill (part) -	400	
e. Garrigill supply (2).	Garrigill (part) -		
		2,450	
Bootle, R.S.D.: Silecroft water supply.	Silecroft - -	200	High
Brampton, R.S.D.:			
a. Brampton supply.	Brampton - -	2,000	
b. Midgeholme supply.	Midgeholme - -	400	
c. Spelter works supply.	Spelter works - -	500	All h
d. Talkin supply.	Talkin - - -	200	
		3,100	
Penrith, R.S.D.:			
a. Langwathby supply.	Langwathby - -	300	
b. Ainstable supply.	Ainstable - -	150	
c. Great Salkeld supply.	Great Salkeld - -	200	
d. Skirwith supply.	Skirwith - -	400	All ex w Li sma
e. Blencairn supply.	Blencairn - -	150	
f. Croglin supply.	Croglin - -	200	
g. Threlkeld supply.	Threlkeld - -	230	
h. Lazonby supply.	Lazonby - -	600	

MBERLAND.]

TRICTS in the County of Cumberland, the Source or Sources of each such ery, and the Townships, Localities, or Places in each instance obtaining mstances of delivery to Consumers of the Water, and Facts as to the

ether Filtered or erwise Treated.	Whether Lead Service Pipes are in use.	Whether Lead Cisterns are in use.	Presence or absence of Lead Poisoning among Consumers according to Information supplied by the Medical Officers of Health.
5.	6.	7.	8.
- -	Yes	Very few	None heard of as due to water supply.
- -	No	No	
only stored in servoir.	No	No	None heard of.
- -	Yes	No	None heard of.
icairn water is tered through nd and gravel. ne rest are un- sated.	No	No	None heard of.

Name of Rural Sanitary District Water Supply.	Districts supplied.	Estimated Population receiving the Water.	Sou
1.	2.	3.	
Whitehaven. R.S.D. :			
a. Parton supply.	Parton - -	1,600	Local
b. Moresby supply.	Moresby (part) -		
Wigton, R.S.D. : Three small villages have separate supplies, with standpipes at different points.	*a.* - - -	150	
	b. - - -	450	
	c. - - -	200	
		800	

[Cumberland]—*continued.*

Whether Filtered or otherwise Treated.	Whether Lead Service Pipes are in use.	Whether Lead Cisterns are in use.	Presence or absence of Lead Poisoning among Consumers according to Information supplied by the Medical Officers of Health.
5.	6.	7.	8.
No - -	No	No	None heard of.
No - -	No	No	None heard of.

(3) Westmorland.

Information with respect to water supplies, and lead poisoning therewith, has been received from seven urban and three rural sa in the county of Westmorland. The 10 districts in question hav an area of about 503,073 acres, and a population of some 66,538 Of the total population it is estimated that 27,324 persons, or cent., obtain water from some public service, while the remainin practically 59 per cent., are dependent upon private sources of su

A.—Water Supplies: Public and other.

In Table II.c.* will be found, with respect to the seven ur districts in the county of Westmorland, the general data as population; and the estimated number of persons respectively s water by a public service, and of those dependent upon priva supply.

From this table it appears that of the aggregate population of 2 it is estimated that 24,242, or 97 per cent. of the whole, are su or other of the public services, while the remaining 708, or rath 3 per cent., are dependent upon private sources of supply.

Table II.c. [Westmorland.]

Summary of the Returns with respect to the Water Supp Urban Sanitary Districts situate in the County of West

Name of Urban Sanitary District.	Area in Acres. (1881 Census Report.)	Population, 1881, (Preliminary Census Report, 1891.)	Population, 1891. (Preliminary Census Report, 1891.)	In Urban Distri having Public Water Supply Estimated Population	
				Served from Public Source.	Depe dent Priva Sourc
1.	2.	3.	4.	5.	6.
Ambleside - -	4,371	1,989	2,360	*2,300*	*60*
Appleby - -	1,855	1,855	1,776	1,776	—
Bowness - -	995	1,855	2,062	*2,000*	*62*
Grasmere - -	3,013	684	1,016	*986*	*30*
Kendal - -	2,622	13,696	14,430	14,430	—
Kirkby Lonsdale -	3,254	1,733	1,802	1,500	302
Windermere -	100	1,269	1,504	1,250	254
Total -	16,210	23,081	24,950	24,242	708

In Table III.c. are given similar data for the three rura districts, and as regards these districts it appears that out of an estimated population of 41,588 persons, it is computed that only per cent., receive water from public sources, while the enormous 38,506, or nearly 93 per cent., are entirely dependent upon private supplies.

* There being no county boroughs in West[illegible] there is no material for T

TABLE III.c. [WESTMORLAND.]

SUMMARY of the RETURNS with respect to the Water Supply of the 3 RURAL SANITARY DISTRICTS in the County of Westmorland.

Name of Rural Sanitary District.	Area in Acres. (1881 Census Report.)	Census Population, 1881.	Estimated Population, 1890.	In Rural Districts having Public Supply, Estimated Population		Population of Rural Districts wholly dependent on Private Sources.
				Served from Public Source.	Dependent on Private Sources.	
1.	2.	3.	4.	5.	6.	7.
East Ward -	183,011	13,560	12,770	1,600	11,170	—
Kendal - -	181,912	20,348	20,500	1,150	19,350	—
West Ward -	121,940	8,225	8,318	332	7,986	—
Total -	486,863	42,133	41,588	3,082	38,506	—

B.—PUBLIC WATER SUPPLIES AND LEAD POISONING.

In Tables V.c.* to VII.c. will be found an analysis of the circumstances as regards source, delivery, and distribution of the public water supplies in the county of Westmorland; together with information as to the presence or absence of lead poisoning in connexion with such supplies.

From these tables it will be seen that no led poisoning attributable to public water supply has been reported as regards this county. Three cases only of any kind are mentioned; one some years ago at Kirkby Lonsdale, the patient being a painter; one more recently, a plumber at Kendal; and one recent case in the Windermere Urban District, apparently due to drinking water from a private well, the pump in connexion with which had been newly constructed. The water from this pump, the Medical Officer of Health ascertained, contained an appreciable quantity of lead.

As in the case of Cumberland, so in Westmorland, lead service pipes and lead cisterns are but little used.

* There being no county boroughs in Westmorland there is no material for Table IV.c.

TA

NOTING with reference to WATER COMPANIES in the County of Wes
otherwise Treated by the Water Authority, and the several Sanitary
Area as to circumstances of delivery to Consumers of th

Name of Water Company.	Districts supplied.	Estimated Population receiving the Water.	Source of the
1.	2.	3.	4.
Ambleside Gas and Water Company.	Ambleside, U.S.D. -	2,300	Scandale V miles distan
Kendal Union Gas and Water Company.	Kendal, U.S.D. - -	14,430	Partly from on Benson K miles from and partly f well at Mint
	Kendal, R.S.D. (part) -	150	
		14,580	
Windermere District Gas and Water Company.	Windermere, U.S.D. -	1,250	Dubs Valley, from Winde
	Bowness, U.S.D. -	2,000	
		3,250	

TABL

NOTING the Water Supplies possessed by URBAN SANITARY DISTRIC
or not the Water is Filtered or otherwise Treated by the Water A
together with Data for each Sanitary Area as to circumst
of Lead Poisoning in connexion therewith.

Name of Urban Sanitary District Water Supply.	Districts supplied.	Estimated Population receiving the Water.	Source of the
1.	2.	3.	4.
Appleby Corporation Waterworks.	Appleby, U.S.D. -	1,776	Bankwood, 2 m tant.
	Brackbenber, in East Ward R.S.D.	Not stated	-
Grasmere Local Board Waterworks.	Grasmere, U.S.D. -	986	Gathering gro Tongue Ghyl distant.
Kirkby Lonsdale Local Board Waterworks.	Kirkby Lonsdale, U.S.D.	1,500	Gathering gro Fleet, 2 mil Kirkby Lons

ource of Sources of each Supply, whether or not the Water is Filtered or ch instance obtaining the Supply; together with Data for each Sanitary Facts as to occurrence or not of Lead Poisoning in connexion therewith.

her Filtered or wise Treated.	Whether Lead Service Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among Consumers of the Water according to Information received from the Medical Officers of Health to the Districts supplied.
5.	6.	7.	8.
- -	No	Not for drinking purposes.	None heard of.
d through n screens.	No	No	None heard of.
	No	Nearly all iron	None heard of.
- -	Yes	No	None heard of as due to public water supply.
	No	Very few	None heard of.

STMORLAND.]

nty of Westmorland, the Source or Sources of each such Supply, whether the several Sanitary Districts in each instance obtaining the Supply; ery to Consumers of the Water, and Facts as to the occurrence or not

ther Filtered or erwise Treated.	Whether Lead Service Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among Consumers of the Water according to the Information supplied by the Medical Officers of Health.
5.	6.	7.	8.
- -	No	No	None heard of.
- -	Not stated	Not stated	None heard of.
- -	No	No	None heard of.
- -	Yes	A few	None heard of as due to the water supply.

NOTING the Water Supplies possessed by, or provided for, R such Supply, whether or not the Waters are Filtered bef together with Data for each such Place or Locality as of Lead Poisoning in connexion therewith.

Name of Rural Sanitary District Water Supply.	Districts supplied.	Estimated Population receiving the Water.	S
1.	2.	3.	
East Ward, R.S.D.:			
a. Dufton supply.	Dufton - - -	300	All
b. Whiston supply.	Whiston - -	150	
c. Hilton supply.	Hilton - - -	150	
d. Orton supply.	Orton - - -	500	
e. Tebay supply.	Tebay - - -	500	
		1,600	
Kendal, R.S.D.:			
a. Braithwaite Green supply.	Braithwaite Green -	200	Not s
b. Natland supply.	Natland - -	100	Sprin
c. Gatebeck supply.	Gatebeck - -	200	Reser
d. Staveley supply.	Staveley - -	100	Spring
		600*	
West Ward, R.S.D.: Askham water supply.	Askham Village -	332	Spring Hig

* It is estimated that other 550 persons in the Kendal R.S 150 from the Kendal Union Gas and Water Company. The fo total population given in column 3 of Tables V.c., VI.c., and VII.c served from public sources in Westmorland being thus 27,324 a

[WESTMORLAND.]

DISTRICTS in the County of Westmorland, the Source or Sources of each the Townships, Localities, or Places in each instance obtaining the Supply; of delivery to Consumers of the Water, and Facts as to the occurrence or not

Whether Filtered or otherwise treated.	Whether Lead Service Pipes are used.	Whether Lead Cisterns are used.	Presence or absence of Lead Poisoning among Consumers according to the Information supplied by the Medical Officers of Health.
5.	6.	7.	8.
c. Filtered through gravel. *d.* and *e.* Stored in iron tanks.	- - -	- - -	None heard of in connexion with any of these supplies.
Not treated in any way.	No	A few; but nearly all iron.	None heard of.
Not stated -	No	- - -	None heard of.

from public sources, viz., 400 from the Grange Local Board Waterworks and in Table VI. A. [Lancashire]; and the latter in Table V.c. [Westmorland]. The short of that given in column 3 of Tables II.c. and III.c.; the estimated population would appear from Tables V.c., VI.c., and VII.c.

ADDENDUM D.

DESCRIPTION of the METHODS adopted in INVESTIGATION of WA

A. Chemical Examination.

The chemical examination of the selected waters comprise tion of:—

(*a.*) *Appearance in 2-foot tube.*—The experiments with th were carried out in the usual way, and the observations turbidity, and residue, afforded a rough indication of the water as regards the presence of suspended and dissol matter.

(*b.*) *Reaction with alcoholic solutions of Cochineal, Methyl Lacmoid.*—These qualitative observations of the reaction with different and delicate indicators were regarded as in reaction of soft moorland waters being not fully understoo presumption in favour of one indicator succeeding where a in demonstrating the presence of acidity, or, it might be, of

(*c.*) *Residue on Evaporation.*—The estimation of the tot carried out in the usual manner; and it was considered not to discover the loss on ignition, as bearing on the different vegetable organic matter, and mineral matter, when subjecte

(*d.*) *Ammonia (free and albuminoid).*—The ammonia was Wanklyn's process. Of each sample an amount was distilled allow of four lots (each of 50 c.c.) being successively separately Nesslerised *before*, and of other four lots (each of similarly dealt with *after*, the addition of the alkaline p solution. The reason was that experience showed that in where moorland water was in question, the ammonia was given off, so that the last 50 c.c. collected contained an quantity of ammonia. A considerable number of experimen carried out to determine the amount of suspended ammonia i waters examined.

(*e.*) *Oxidized Nitrogen.*—The nitrites were determined qua Griess's napthylamine process; and the nitrates quantitat copper-zinc couple process.

The determination of the nitrates, and the presence o nitrites, was of importance, as it has been held that the ac of waters largely depends on the state of combination of n oxygen contained in the water.

(*f.*) *Oxygen required to Oxidize the Organic Matter.* — required to oxidise the organic matter was determined b process as modified by Blair, the water being kept for two temperature of 100° C. The standard solutions were sodium and potassium permanganate.

(*g.*) *Chlorine.*—The chlorine was estimated in the usual standard solution of silver nitrate, and a solution of potassiu as indicator.

(*h.*) *Hardness.*—Clarke's soap test was used to determine th The importance of keeping a record of the hardness of the w no comment, since many investigators assert that it is esp waters which act on lead; that hard waters hardly ever ability.

(*i.*) *Dissolved Oxygen.*—Thresh's process was used to es amount of the dissolved oxygen. The precaution was take having the samples bottles filled completely full of water, and as soon after the collection as possible—the first portion of from the bottle for analysis, for the determination of th oxygen.

(*j.*) *Iron.*—The presence of iron was always tested for, as a suspicion existed that iron might, in some way or other, be a factor in giving a water plumbo-solvent ability.

(*k.*) *Acidity.*—Whenever a water was found to give an acid re-action with methyl orange, cochineal, or lacmoid, the amount of the acidity was determined by titrating a known quantity of the water with a decinormal solution of sodic carbonate. Phenol-phthalein was used as an indicator, and although open to some objections, it was found that by its use comparable results were obtained. The acidity was estimated quantitatively, with the object of seeing whether the plumbo-solvent ability of a particular water, from time to time, or of one water as compared with another water, varied directly with the amount of the acidity.

(*l.*) *Plumbo-solvency.*—A determination of the plumbo-solvent properties of the various waters was considered essential; but the difficulty arose that of all the methods in use, when this inquiry commenced, none gave comparable results. To Dr. Whitelegge is due the credit of suggesting the filtration of the water through lead shot. It was found, however, that ordinary lead shot did not react very sensibly to the influence of acid waters; shot, therefore, was specially prepared, free from arsenic and the other impurities which give to ordinary lead shot its necessary quality of hardness.

The process was carried out in the following way:—

Fifty c.c. of washed lead shot were placed in a burette, occupying 18 inches of its length, and the sample water allowed to filter slowly downwards through the lead. The water was collected in successive lots of 50 c.c., and tested with sulphuretted hydrogen or ammonium sulphide for the presence of lead. The amount of lead was estimated by colour-titration, the standard solution of lead acetate being of such a strength that 1 c.c. was equivalent to 1 mgrm. of lead.

The experiments were carried out in a comparative manner, and the precaution was taken of using fresh shot for each determination, the old shot being thrown aside lest its use should introduce a possible source of error. A note was taken of the temperature of the water during the course of the experiment.

B. *Bacteriological examination of the selected Waters.*

The bacteriological examination of the selected waters comprised:—

(*a.*) The estimation of the number of bacteria.

(*b.*) The separation, and study of pure culture, of the different kinds of micro-organisms.

The bacteriological examination was conducted as follows:—

The samples of water were collected in sterilised tubes, and submitted to examination the same day, as soon after collection as possible.

The numerical determination of the bacteria was made by inoculating nutrient gelatin with a suitable quantity of the water, and pouring the melted gelatin into Petri-dishes. In the earlier experiments Agar-Agar, as well as gelatin, was used as a nutritive medium. The cultivations were kept at a temperature of 20° C. and 37° C., according to whether the medium was gelatin or Agar. The colonies were counted at as late a date as the liquefaction of the gelatin and the crowding of the organisms would allow. Pure cultivations were made of the different kinds of microbes met with in the investigation, with the object of discovering points of distinction between the different waters, not only as regards the number but also as to the characteristics of the bacteria contained in them.

It was thought that the bacteriological study of these waters undertaken side by side with the chemical experiments, and more especially with the comparative experiments on plumbo-solvency, might perhaps establish a relation between the ability of a water to act on lead, and the number or the species of its contained bacteria.

App. A. No. 13.

On the Causes of Lead Poisoning; by Mr. Power.

ADDENDUM H.

Description of two Bacteria isolated from Peat, whic in peat decoction gave to the liquid acid reactio solventability; by Dr. A. C. Houston.

These two micro-organisms are provisionally termed O, and Peat Bacterium Q. It is not intended in this pap account of these two bacteria; their description will be detailed report. An outline only of their biological an characteristics is here attempted.

Description, in tabular form, of two Bacteria Isolated f which would appear to be causally related to the obse moist peat soil on moorland gathering grounds.

Peat Bacterium O.	Peat Ba
(A.) Where found.	
Found in peat soil—rarely in peat water.	
(B.) How isolated.	
Isolated directly from peat soil by gelatin plate cultivation; an by inoculating sterile peat decoction with an exceedingly small an and, in the cases where acidity was produced, making plate cult liquid.	
(C.) Morphological characters.	
The cells, which are irregularly grouped together, appear at fi careful observation shows that in reality one diameter slightly ex The cells are non-motile.	
(E.) Biological characters.	
There is no liquefaction of the gelatin.	
(*a.*) Growth in gelatin plate, and "roll" cultivations	
(1.) Microscopic appearances:—The chief points to be noted in studying the growth of the superficial colonies are;—	
The iridiscent, almost transparent, and film-like character of the young colonies.	This bacterium very closely, but
The rapid rate of growth, unaccompanied by any liquefaction of the gelatin.	not grow or sprea
The irregular manner in which the colonies spread over the nutrient surface, and the irregular thickening of the bacterial mass.	are not so transpar The ultimate size is less, and the th bacterial mass as is greater and mor
The final appearance of the colonies as white opaque plates, with lobed, fissured, and raised borders, and the granular wrinkled character of their surfaces.	
The deep colonies occur as small white bodies more or less circular in shape, which either remain imbedded in the nutrient gelatin, or, by reaching the surface in their growth, spread out superficially or project as small papillæ.	Practically the s

Peat Bacterium O.	Peat Bacterium Q.
(2.) Microscopic appearances (under a low power). The superficial colonies are greyish brown in colour. The remains of the original colony can usually be seen near the centre as a dark spot, and from this the colour fades towards the periphery; the edge in the older colonies, however, is dark owing to its greater thickness. The colonies have a granular and striated appearance. The deep colonies show no special peculiarities; they are dark brown in colour and faintly granular in structure.	The colonies are more opaque, and their colour darker, otherwise the appearances are the same as in O.
(*b.*) Growth in gelatin puncture cultivations.	
A white coloured growth appears along the line of the inoculation, composed of numberless small colonies which have become confluent—the puncture has thus a granular appearance. The marked development of gas which occurs gives rise to the formation of gas spaces and fissures throughout the substance of the nutritive medium. The growth on the surface is comparable to the growth of the superficial colonies in plate cultivations. At first a thin bluish white iridiscent film forms at the point of inoculation. Later the colony becomes opaque and granular in character, and the border, when it has ceased to spread, becomes irregularly thickened and raised. In old cultivations furrows and radial thickenings run in tortuous lines over the surface of the growth.	The appearances are nearly the same as in the case of O, but the surface growth is more limited in extent, and of greater thickness.
(*c.*) Growth in gelatin stroke cultivations.	
The growth resembles an elongated superficial colony from a plate culture. It begins first as a bluish white film spreading in an irregular fashion on either side of the inoculation stroke. Later the surface of the growth becomes opaque and granular, and the border irregularly thickened.	The appearances are nearly the same as in the case of O, but the growth spreads less in a lateral direction, and is thicker, especially along the edges.

(*d.*) Growth in bouillon cultivations.

The liquid becomes cloudy, but there is no pellicle formation. Gradually a white bacterial deposit collects at the bottom of the tube. The liquid acquires an acid reaction.

(*e.*) Growth in peat decoction.

(The peat decoction was prepared by boiling peat with distilled water, straining through muslin, boiling with peat charcoal, and filtering very slowly through filter paper. The filtration was repeated until the liquid came through perfectly transparent, but of a bright yellow or brown colour.)

The peat decoction became cloudy in appearance, and acquired a distinct acid reaction, as well as considerable plumbo-solvent ability. Control experiments were simultaneously carried out. The action on lead was tested by upward filtration through lead shot.

Moorland waters are known to be acid in reaction, and to have plumbo-solvent properties. These waters are derived, for the most part, from the rain falling on peaty gathering grounds. Part of the rainfall sinks through the soil and comes to the surface again as spring water;

but the greater portion saturates the peat, and escapes only
out of its substance by successive rainfalls and after more
contact with the soil. Moist peat is itself acid in rea
bacteria are found in peat, and when grown in peat deco
acidity and plumbo-solvent ability of the liquid. The infe
acidity and plumbo-solvent ability observed in moorland
to be traced to the washing out of the products of the life p
bacteria from the substance of peat soil. It is to be
spongy, moist, and nutritious character of peat soil would
the development of these bacteria. Their presence in
accidental, and not causally related to the acidity of the wa
likely that these micro-organisms would find sufficient nou
for the exercise of their acid-producing function. It mus
from what has been said, that the acidity of peat soil is of
and wholly due to the life history of these or other germs
a complex one, but it is probable that chemical as well
changes are concerned in the production of the acidity. F
be, it is important to again note that (a) moorland waters
are acid in reaction and have plumbo-solvent abilities;
acid; (c) these bacteria are found in peat and when
decoction give rise to acidity and plumbo-solvent ability

riations, with
ver the Period

SSOLVED OXYGEN
Percentage
above mean
below mean
130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130
April. May. June. July. Aug. Sept. Oct. Nov. Dec. Jan. Feb. March.
UMBO-SOLVENCY
RAINFALL

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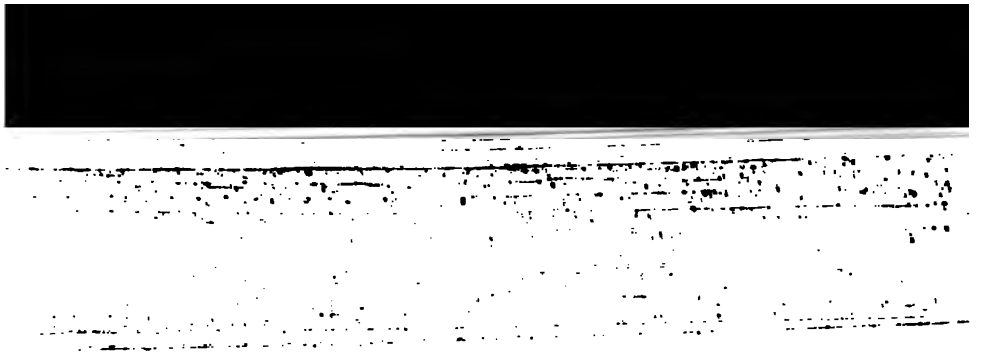

Plumbo-Solvent Ability
No record
No record
April
May
June
July
August
September
October
November
December
January
February
March
1.K
Practicability
Wyman & Sons, Ltd. Lith.

[redacted]

The figures in black refer to the number of samples of each water examined.
" " " red " " " " in register by which the water is designated.
a - water of peat feeder to moorland reservoir.
b - water from stagnant peat pool.
c - water from moorland reservoir.
d - moorland water as sent into consumption.
e. - spring water to moorland reservoir.
f - mixture of peat and spring water to moorland reservoir.
+ - water not "treated" with a view to correcting its plumbo-solvent ability.
● - water "treated" " " " " " " " " "

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No. 14.

Report on Cholera in Germany during the Winter of 1892–93; by Dr. F. W. Barry.

In continuation of my observation of the Western diffusion of cholera published in the last Annual Report* I have the honour to submit the following account of certain outbreaks of the disease that occurred in Germany during the winter of 1892–93, and which must be regarded as directly connected with the diffusion of 1892.

The epidemic of cholera in the German Empire, which commenced at Hamburg on August 16th, 1892, had up to November 19th of that year attacked upwards of 18,500 persons, and had caused over 9,500 deaths. By the middle of November the disease had become practically extinct in Germany, but in December 1892 and in the earlier months of 1893 the three following outbreaks of cholera were observed:—

(*a.*) One at Hamburg, commencing on December 5th, 1892, and terminating on March 3rd, 1893. In this outbreak 64 cases of cholera were recorded, of which 17 proved fatal, and from this group of cases infection was conveyed to five other places, where it gave rise to 11 attacks, of which three were fatal.

(*b.*) A second at Altona, commencing on December 23rd, 1892, and terminating on February 12th, 1893. In this outbreak 45 cases of cholera were recorded, of which 24 proved fatal; and

(*c.*) A third in the Provincial Lunatic Asylum at Nietleben, on the River Saale, near Halle, commencing on January 14th, 1893, and terminating on February 13th. In this outbreak 122 cases were recorded, of which 52 proved fatal. From Nietleben cholera was conveyed to four other places, situate lower down the River Saale, where it gave rise to 13 attacks, of which four were fatal.

All three outbreaks have been very fully investigated by Professor Koch,†; that at Hamburg also by Drs. Reincke‡ and Gaffky§; and I propose to quote at considerable length from the reports of these gentlemen, as the outbreaks in question were of exceptional interest from an etiological point of view.

(*a.*) *The after-epidemic in Hamburg.*—As already stated, the first case of cholera occurred on December 5th, 1892, and the last on March 3rd, 1893. Including those only slightly affected, and a few who showed no signs of disease except the presence of "commas" in their dejecta, 64 persons were attacked, and of these 17 died. In the following Table I., is given a daily record of the cholera cases and deaths as reported by Dr. Reincke, during the period under consideration, from which it will be seen that considerably more than half the cases occurred during the last fortnight of the year.

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* *See* Supplement to the 22nd Annual Report of the Local Government Board, 1892–93, pp. 117–236.

† Die Cholera in Deutschland, während des Winters, 1892 bis 1893. Von Professor R. Koch. Zeitschrift für Hygiene und Infectionskrankheiten. Fünfzehnter Band, 1893, pp. 89–165.

‡ Bericht des Medicinal Inspectorats über die Medicinische Statistik des Hamburgischen. Staates für das Jahr, 1892, pp. 44–50.

§ Die Nach-Epidemie im Winter 1892–93. Von Dr. Georg Gaffky. Arbeiten aus dem Kaiserlichen Gesundheitsamte. Zehonter Band, pp. 99–115. Berlin, 1894

Table I.

Daily Record of Cholera Cases and Deaths during the Wi at Hamburg.

Day of Month.	Number of Cholera		Week ending	Number of Cholera		Day of Month.	Number of Cholera		
	Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.	
1892.			1892.			1893.			
Dec. 4	—	—				Jan. 8	2	2	
„ 5	1	1				„ 9	1	—	
„ 6	—	—				„ 10	4	—	
„ 7	—	—	Dec. 10	3	2	„ 11	2	1	
„ 8	2	1				„ 12	—	—	
„ 9	—	—				„ 13	—	—	
„ 10	—	—				„ 14	—	—	
„ 11	—	—				„ 15	1	—	
„ 12	1	—				„ 16	1	1	
„ 13	—	—				„ 17	3	—	
„ 14	1	—	„ 17	3	—	„ 18	—	—	
„ 15	—	—				„ 19	1	—	
„ 16	1	—				„ 20	—	—	
„ 17	—	—				„ 21	—	—	
„ 18	3	1				„ 22	—	—	
„ 19	—	—				„ 23	—	—	
„ 20	2	1				„ 24	—	—	
„ 21	5	1	„ 24	18	5	„ 25	—	—	
„ 22	2	1				„ 26	—	—	
„ 23	2	1				„ 27	—	—	
„ 24	4	—				„ 28	—	—	
„ 25	3	1				„ 29	1	1	
„ 26	5	3				„ 30	—	—	
„ 27	3	—				„ 31	—	—	
„ 28	1	—	„ 31	18	5	Feb. 1	—	—	Fe
„ 29	2	1				„ 2	—	—	
„ 30	3	—				„ 3	1	—	
„ 31	1	—				„ 4	—	—	
1893.			1893.			„ 5	—	—	
Jan. 1	3	—				„ 6	—	—	
„ 2	—	—				„ 7	—	—	
„ 3	—	—				„ 8	—	—	„
„ 4	1	—	Jan. 7	4	—	„ 9	—	—	
„ 5	—	—				„ 10	—	—	
„ 6	—	—				„ 11	—	—	
„ 7	—	—				„ 12–18	—	—	„ 1
						„ 19–25	—	—	„ 2

Table I.

Daily Record of Cholera Cases and Deaths during the Winter at Hamburg.

Day of Month.	Number of Cholera		Week ending	Number of Cholera		Day of Month.	Number of Cholera		Week end
	Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.	
1892.			1892.			1893.			18
Dec. 4	—	—				Jan. 8	2	2	
„ 5	1	1				„ 9	1	—	
„ 6	—	—				„ 10	4	—	
„ 7	—	—	Dec. 10	3	2	„ 11	2	1	Jan
„ 8	2	1				„ 12	—	—	
„ 9	—	—				„ 13	—	—	
„ 10	—	—				„ 14	—	—	
„ 11	—	—				„ 15	1	—	
„ 12	1	—				„ 16	1	1	
„ 13	—	—				„ 17	3	—	
„ 14	1	—	„ 17	3	—	„ 18	—	—	„
„ 15	—	—				„ 19	1	—	
„ 16	1	—				„ 20	—	—	
„ 17	—	—				„ 21	—	—	
„ 18	3	1				„ 22	—	—	
„ 19	—	—				„ 23	—	—	
„ 20	2	1				„ 24	—	—	
„ 21	5	1	„ 24	18	5	„ 25	—	—	„
„ 22	2	1				„ 26	—	—	
„ 23	2	1				„ 27	—	—	
„ 24	4	—				„ 28	—	—	
„ 25	3	1				„ 29	1	1	
„ 26	5	3				„ 30	—	—	
„ 27	3	—				„ 31	—	—	
„ 28	1	—	„ 31	18	5	Feb. 1	—	—	Feb
„ 29	2	1				„ 2	—	—	
„ 30	3	—				„ 3	1	—	
„ 31	1	—				„ 4	—	—	
						„ 5	—	—	
1893.			1893.			„ 6	—	—	
Jan. 1	3	—				„ 7	—	—	
„ 2	—	—				„ 8	—	—	„
„ 3	—	—				„ 9	—	—	
„ 4	1	—	Jan. 7	4	—	„ 10	—	—	
„ 5	—	—				„ 11	—	—	
„ 6	—	—				„ 12-18	—	—	„
„ 7	—	—				„ 19-25	—	—	„

consumption, such as water, when explosions occur varying according to the nature of the vehicle.

The Hamburg summer epidemic belonged at first exclusively to the first type, but towards its end passed into the second. The Hamburg winter epidemic, on the other hand, maintained almost entirely the second type during its whole duration, and a tendency to form centres characterised it from the first. From a reference to Plan I. it will be observed that one of these centres was situate in Neustadt, a second in Sankt Georg, and a third in Sankt Pauli. The centres in Neustadt and Sankt Georg are regarded by Professor Koch, as having, probably, originated in undetected stragglers of the summer epidemic, and that in Sankt Pauli as having had its origin partly in Altona and partly in Neustadt. He further points out that it was a very characteristic feature of the after-epidemic "that the patients belonged, without "exception, to the lowest stratum of the population. They were people "without work and without homes; drunkards living in common "lodging-houses and spirit shops, itinerant hawkers who sold matches, "sausages, or the like, and whose trade led them, too, into such haunts; "sailors, dock labourers, persons under police arrest, &c. In all the "cases, except eight, relation to persons who had suffered from "cholera and from whom the infection might have been directly or "indirectly caught was proved. * * * A common cause, such as "the influence of the soil, the water, or the like, certainly did not exist "in this epidemic. The water supply was out of the question, for the "district affected did not coincide, as in summer, with the sphere of the "water supply. The soil might have seemed open to suspicion, as the "disease was restricted to certain localities. In this case, however, "the place could not be the decisive factor, but, on the contrary, the "people resident in the place, for the disease always ceased the moment "the patients and the suspected were removed. Had the infecting "agent been inherent in the locality, fresh cases should have occurred— "despite the removal of the infected persons—among those who freely "visited the houses in question. The only remaining explanation is "that the disease was transmitted from person to person, and this "explanation is decidedly supported by the chain-like connexion of "most of the cases."

Although it may be assumed that water did not play the part of a general factor in this after-epidemic, its influence as a propagator of cholera was not entirely absent; for from the investigations made, there is little doubt that it had to do with an outbreak among the crews of two ships that lay in Hamburg harbour, the "Murciano," and the "Gretchen Bohlen." The former of these was moored at the Asia Quay, near a closet which is said to have been used by a workman suffering from cholera. On the 8th January, two of the crew were taken to the hospital, suffering from cholera; the remainder, 24 in number, were also removed for observation purposes, and four slight cases of cholera were confirmed amongst them. The vessel was taken to the Strandhafen whilst she was in course of disinfection, and her frozen closets were there thawed (January 12th), and the contents discharged into the water. The SS. "Gretchen Bohlen" was moored close to the "Murciano," and three days afterwards (January 15th) two cases of cholera broke out on board the former vessel. Upon examination of the rest of the crew, 17 in number, four more slight cases of cholera were confirmed. It was ascertained that these men had, like the men on the "Murciano," drunk much water taken directly from the harbour, at points which must, from the circumstances related above, have been specifically polluted by cholera dejecta.

Although the winter epidemic in Hamburg was, compared with that which occurred in the city in the previous summer, very slight, it was not without its offshoots. In the beginning of January, a man travelled from Hamburg to Schwerin, and died there from cholera. Four cases were carried from Hamburg to Elmshorn in the Pinneberg district. Another case the cause of which was stated not to have been completely cleared up, is said to have occurred near Hamburg, at Ostorf, also in the district of Pinneberg. On January 6th, a ship's carpenter who had worked in that part of Hamburg harbour in which the "Murciano" was moored, died of cholera at Neuhof, on the island of Wilhelmsberg, in the Elbe. Three cases of cholera occurred at Schulau, and one at the adjacent town of Wedel. These cases could not be traced directly to Hamburg, but the water of the Elbe would appear to have formed the connecting link.

The comparatively light fatality observed during the winter epidemic, namely, 26·5 per cent. of the cases attacked, was probably not due to any lessened virulence of the disease, but to the fact that many slight cases—cases in which the presence of cholera bacilli was confirmed, but which presented very slight symptoms, or none, of cholera,—were included amongst the attacks.

(*b.*) *The Winter Epidemic in Altona.*—In Table II. is given a daily record of the cholera cases and deaths reported to have occurred at Altona during the winter of 1892–93, from which it will be seen that the first case took place on December 23rd, at about the time when the winter epidemic in Hamburg was at its height, and that upwards of two-thirds of the total cases were recorded during the three weeks ended February 11th, 1893.

Table II.

Daily Record of Cholera Cases and Deaths during the Winter of 1892–93 at Altona.

Day of Month.	Number of Cholera		Week ending	Number of Cholera		Day of Month.	Number of Cholera		Week ending	Number of Cholera	
	Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.
1892.			1892.			1893.			1893.		
Dec. 18	—	—				Jan. 1	—	—			
„ 19	—	—				„ 2	—	—			
„ 20	—	—				„ 3	—	—			
„ 21	—	—	Dec. 24	1	—	„ 4	—	—	Jan. 7	2	
„ 22	—	—				„ 5	1	1			
„ 23	1	—				„ 6	—	—			
„ 24	—	—				„ 7	1	—			
„ 25	1	1				„ 8	—	—			
„ 26	—	—				„ 9	—	—			
„ 27	1	1				„ 10	—	—			
„ 28	—	—	„ 31	4	4	„ 11	1	—	„ 14	1	—
„ 29	—	—				„ 12	—	—			
„ 30	2	2				„ 13	—	—			
„ 31	—	—				„ 14	—	—			

Day of Month.	Number of Cholera		Week ending	Number of Cholera		Day of Month.	Number of Cholera		Week ending	Number of Cholera	
	Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.
1893.			1893.			1893.			1893.		
Jan. 15	—	—				Feb. 5	1	—			
„ 16	—	—				„ 6	3	—			
„ 17	—	—				„ 7	—	—			
„ 18	—	—	Jan. 21	1	—	„ 8	—	—	Feb. 11	9	1
„ 19	—	—				„ 9	—	—			
„ 20	—	—				„ 10	2	1			
„ 21	1	—				„ 11	3	1			
„ 22	—	—				„ 12	1	—			
„ 23	1	1				„ 13	—	—			
„ 24	1	1				„ 14	—	—			
„ 25	2	2	„ 28	8	6	„ 15	—	—	„ 18	1	—
„ 26	1	—				„ 16	—	—			
„ 27	2	2				„ 17	—	—			
„ 28	1	—				„ 18	—	—			
„ 29	1	1									
„ 30	2	1									
„ 31	2	2									
Feb. 1	1	—	Feb. 4	18	11						
„ 2	3	1							Total	45	21
„ 3	8	5									
„ 4	1	1									

This winter epidemic in Altona bore an entirely different character from that which prevailed in the summer. In the summer of 1892, the great majority of the patients were connected with Hamburg, and in all probability had caught the infection on Hamburg soil, or from persons who had brought it thence. Now, on the contrary, according to Professor Koch, "the patients were, with few exceptions, persons whose "illness could not possibly be explained in that way. They were, "for instance, workmen in fairly good circumstances, whose work did "not require them to go to Hamburg; women of the middle class; "little children who, owing to the cold weather, had not even been out "of the house; a one-year's service soldier; inmates of the hospital "who had been confined to bed for weeks, and had not come into "contact with anybody outside; and a prisoner who fell ill after 12 "days' solitary confinement. There was no connexion whatever "between any of these cases. The simultaneous epidemic in Hamburg "was restricted without exception to the lowest stratum of the popula- "tion, whereas in Altona, only one of the patients, a homeless woman, "belonged to the lowest class; all the rest were persons who could not "have caught the disease by immediate transmission from uncleanly

" people crowded together in unhealthy rooms. Evidently the cholera " in Altona was of a quite different type from that in Hamburg, and " the only explanation of the phenomena was that the infectious matter " was scattered all over the town, but only scantily."

The water supply was at once suspected, for it was clear from the position of the Altona waterworks, situate as they are below Hamburg, that any accident to the filtration works might lead to the distribution of cholera-infected matter by the water service. That disturbances in the working of the Altona filters did actually occur immediately before the outbreak, and that the presence of cholera bacilli was demonstrated in the Elbe water and in the water of the Altona waterworks before filtration, has been fully set forth in Professor Koch's paper on "Water Filtration and Cholera," published in the Medical Officer's last Report.*

Although there is little doubt that the dissemination of cholera in Altona was primarily caused by the distribution of infective matter through the water service, in several instances the infection was at a later date conveyed through other channels. In two or three groups of cases it was transmitted from one member of a family to another, whilst one secondary group of cases is of special interest, and must be referred to in some detail. An account of this outbreak may be summarised from Professor Koch's Report already referred to.

In the Ottensen quarter of Altona there is a small group of houses arranged in courts, which were erected after the great Hamburg fire of 1842 in order to provide shelter for the burned-out people as soon as possible. These courts, which bear the name of "Lang Jammer," are inhabited by about 270 poor people. The houses are not connected with the public water-supply, but obtain their water from an old pump well, situate near the entrance to one of the courts. During the summer epidemic of 1892, two isolated cases only of cholera had occurred in the "Lang Jammer:" so that when, in one week of the winter outbreak, nine attacks with seven deaths took place there, whilst the neighbourhood remained free, attention was at once directed to the special circumstances of the place, with a view to ascertaining the reason of this exceptional cholera incidence. As already stated, the water supply was obtained from a well. This well was so placed at the lowest part of the court in which it was situate that all liquid on the surface of the court had a natural flow towards it. Under ordinary circumstances, the fouling of the well was provided against by drains leading from gulleys to a sewer in the street. The water of this well had been examined early in 1892, and was then found to be fit for use. As, however, this water was suspected of having been the cause of the diffusion of cholera in the winter outbreak, a bacteriological examination of it was made on January 31st, 1893, with the result that the presence in the water of large quantities of Koch's comma-bacillus was demonstrated. The outbreak of cholera in the "Lang Jammer" began on January 20th and ended on February 1st, so that if the water had played a part in the diffusion, it must have become infected some days before January 20th, and on further inquiry, it was ascertained that from December 21st, 1892, to January 24th, 1893, there had been a hard frost, and that during that period the gulleys were frozen up, and slops and other filth passed unchecked to the well. Here it was ascertained that liquid filth obtained access to the water through chinks in the wall of the well. After the well was closed no further cases of

* Supplement to the 22nd Annual Report of the Local Government Board, 1892–93, Appendix C., pp. 448–455.

cholera occurred in that quarter. It may be
ing the yard, on the occurrence of the fir
drawn from the well smelt of carbolic aci
its way in the first instance into the "I
discovered. The last cholera case in Altona
12th; the total cases recorded being 45 with
fatality of 53·3 per cent.

(*c.*) *Cholera at Nietleben.*—The lunatic asyl
was the seat of a peculiarly interesting outbr
1893, which was regarded as an offshoot of th
The asylum, which was built in 1840, cons
Plan II., of a number of detached pavilions.
asylum contained 436 male patients, 375 fen
who had, and 56 who had not, their me
altogether, a population of 991 persons. On
living in that part of the building marked
attacked with cholera, and died the same
(January 15th) six cases, all of which were
16th, there were eleven further cases, eight of
eighteen cases occurred in eleven different
buildings of the asylum. From this time on
reported until February 13th, by which time
and 52 deaths. The sequence in point of tim
in the following Table III.:—

TABLE III.

DAILY RECORD of CHOLERA CASES and DE
LUNATIC ASYLUM during January an

Date.	Recorded Cholera.		Da
	Attacks.	Deaths.	
1893.			18
January 14 - -	1	1	January
„ 15 - -	6	6	„
„ 16 - -	11	8	„
„ 17 - -	15	7	„
„ 18 - -	8	2	February
„ 19 - -	7	2	„
„ 20 - -	16	6	„
„ 21 - -	9	3	„
„ 22 - -	12	5	„
„ 23 - -	8	1	
„ 24 - -	13	1	Tot

Of the 122 cholera patients, 63 were men, in
59 were women, including seven attendants a
In order to give an exact view of the local d
the following Table IV., taken from Professor
break is appended. In this table are given t
the asylum, the number of beds in each de
inmates on the day when cholera broke out, an
of their occurrence.

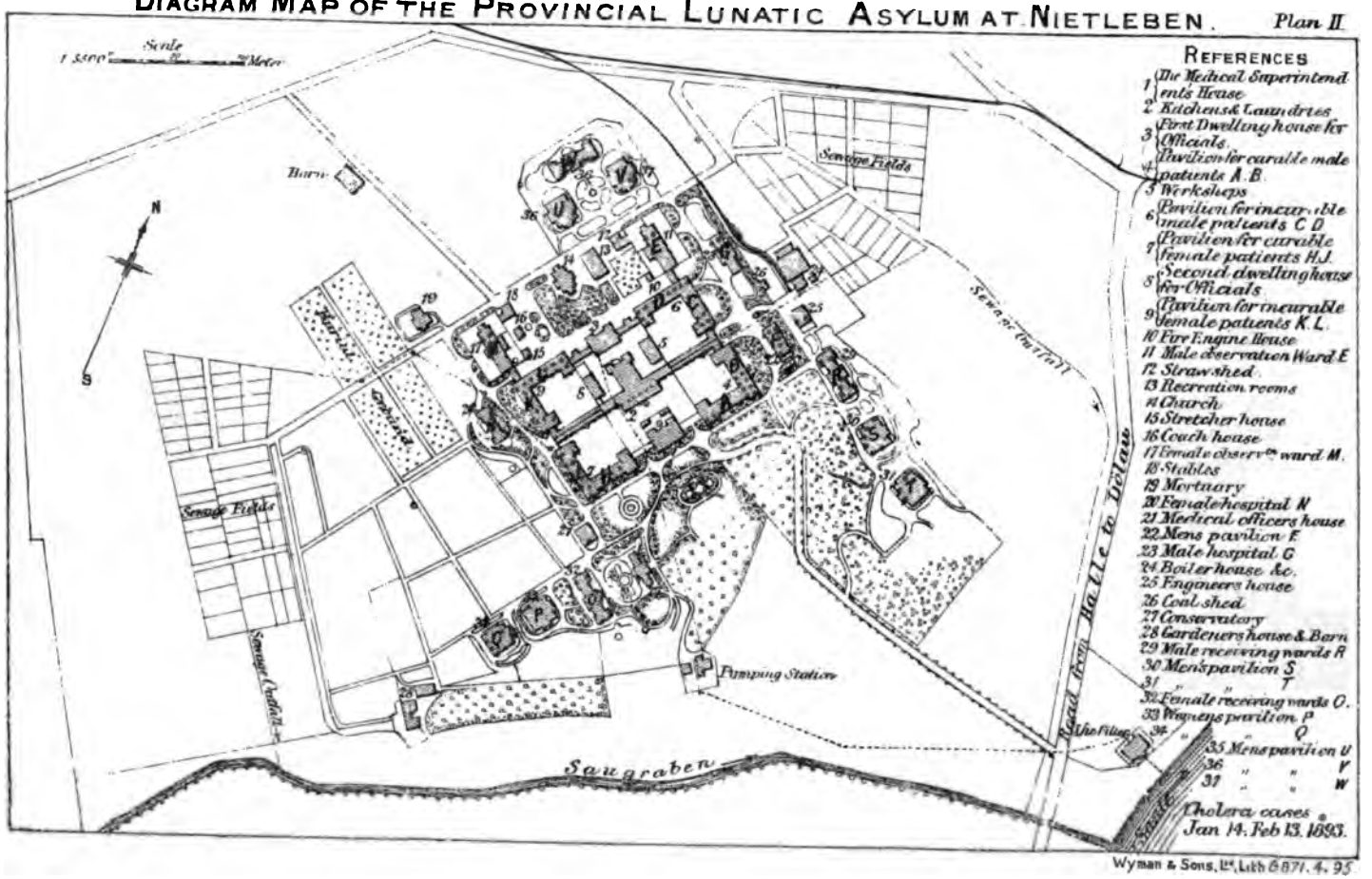
Table IV.

Showing, as regards the several Departments of the Nietleben Lunatic Asylum, the Number of Beds, the Number of Inmates, on January 14th, 1893, and the Number of Persons attacked by Cholera in each Department with the Date of Attack in each Case.

(a.) *The Men's Side.*

Department.	Number of Beds.	Number of Inmates on 14th January 1893, including the Attendants.	Cholera Cases recorded.	Remarks.
Pavilion for curable male patients, lower storey (A I.).	30	28	2 (Jan. 14, 24).	
Pavilion for curable male patients, upper storey (A II.).	9	8	- - - -	Seven patients of the first and the second class with one attendant.
Pavilion for curable male patients, lower storey (B I.).	34	34	4 (Jan. 23, 24, 24, 24).	
Pavilion for curable male patients, upper storey (B. II.).	34	33	4 (Jan. 16, 20, 23, 25).	
Pavilion for incurable male patients, lower storey (C I.).	20	18	4 (Jan. 16, 20, 23, Feb. 10).	Sixteen patients of the first and the second class with two attendants.
Pavilion for incurable male patients, upper storey (C II.).	51	48	5 (Jan. 19, 19, 22, 22, 23).	
Pavilion for incurable male patients, lower storey (D I.)	54	52	5 (Jan. 20, 20, 22, 22, 23).	
Pavilion for incurable male patients, upper storey (D II.).	46	45	7 (Jan. 17, 17, 20, 20, 20, 21, 22).	
Male Observation Wards (E) -	30	29	2 (Jan. 18, Feb. 4).	
Men's Pavilion (F) - -	33	32	7 (Jan. 15, 16, 17, 17, 17, 17, 20).	
Men's Hospital (G) - -	36	23	2 (Jan. 22, 22).	
Male Receiving Wards (R) -	33	32	7 (Jan. 15, 15, 15, 16, 18, 18, 24).	
Men's Pavilion (S) - -	44	37	5 (Jan. 15, 16, 16, 20, 20).	
Men's Pavilion (T) - -	44	36	4 (Jan. 18, 24, 24, 26).	
Men's Pavilion (U) - -	44	—	1 (Jan. 21) a female attendant).	Used immediately after the outbreak of the cholera as a cholera hospital. The patients in (V) were removed to other departments.
Men's Pavilion (V) - -	44	36	1 (Jan. 26) an incurable patient employed in the disinfecting house.	
Men's Pavilion (W) - -	44	—	3 (Jan. 22, Feb. 1, 13) three female attendants.	

DIAGRAM MAP OF THE PROVINCIAL LUNATIC ASYLUM AT NIETLEBEN. Plan II.



REFERENCES

1 The Medical Superintendents House
2 Kitchens & Laundries
3 First Dwelling house for Officials
4 Pavilion for curable male patients A.B.
5 Workshops
6 Pavilion for incurable male patients C.D
7 Pavilion for curable female patients H.J.
8 Second dwelling house for Officials
9 Pavilion for incurable female patients K.L.
10 Fire Engine House
11 Male observation Ward E
12 Straw shed
13 Recreation rooms
14 Church
15 Stretcher house
16 Coach house
17 Female observ^n ward M.
18 Stables
19 Mortuary
20 Female hospital N
21 Medical officers house
22 Mens pavilion F
23 Male hospital G
24 Boiler house &c.
25 Engineers house
26 Coal shed
27 Conservatory
28 Gardeners house & Barn
29 Male receiving wards R
30 Mens pavilion S
31 " " T
32 Female receiving wards O.
33 Womens pavilion P
34 " " Q
35 Mens pavilion U
36 " " V
37 " " W

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the provisions, were set aside. The construction and the management of the water system, which receives its supply from the Wild Saale, is fully described in Professor Koch's paper on "Water Filtration and Cholera," published in the Supplement to the last Annual Report of the Board. (See Appendix C., pp. 444–448.) Its main course is indicated in Plan II.

App. A. 8

"Close to the Wild Saale lie the filters, from which an underground iron "pipe leads the water to the pumping station at the foot of the hill. It "is thence pumped into high reservoirs in buildings 2 and 3, whence it "is distributed all over the establishment by pipes. Another system of "pipes collects the dirty water from the sinks, waterclosets, bath-rooms, "kitchens, &c., and leads it into two main sewers which begin at building "2 and go in opposite directions to the sewage fields on the slopes of "hill on both sides of the establishment. These sewers are of mason "work, are provided with manholes and are up to date in every "respect. The sewage fields, too, are properly laid out. They consist "of horizontal beds rising one above the other. Their soil is drained "to a sufficient depth. The effluent water is collected in a main "conduit, and led in open ditches, both from the northern and the "southern sewage field into a dirty little brook called the Saugraben."

To the fact that this same brook flows into the Wild Saale at a very short distance above the intake of the asylum waterworks and to the grave objection to such an arrangement of the sewerage and water systems, attention has been called in Professor Koch's paper referred to above. In that paper he pointed out that, as managed, much of the water supplied to the establishment was allowed to pass through the sand filters almost unfiltered. As a consequence of this, it was clear that if infective matter was pumped from the Wild Saale, there would be no difficulty in its distribution throughout the institution. Upon inquiry, it was found that immediately prior to the outbreak of cholera, the sewage fields had been frozen, and the asylum sewage had consequently found its way into the Wild Saale practically untreated. Upon bacteriological examination being made, cholera bacteria were found, on the women's side of the asylum, in the sewage at the point where it entered the sewage fields, in the sewage fields themselves, and in the effluent from the sewage fields. On the men's side they were found in the sewage, both before and after its passage over the sewage fields. They were further found in the water of the Wild Saale, also below the mouth of the Saugraben, in the water immediately after it had passed through the filters, and in a sample taken from one of the water pipes in the asylum itself. Once more to quote Professor Koch:—

> "The immediate cause of the explosive outbreak at Nietleben is "thus rendered perfectly clear. Infectious matter must have been "brought into the asylum in some way or other, then passed with "the dirty water of the establishment over the frozen sewage fields "into the Saugraben, from the Saugraben into the Wild Saale, "and from the Wild Saale through the water conduit back to the "asylum. The water was accessible to all the inhabitants of the "establishment, and an explosive epidemic, attacking the whole "asylum, more or less equally, according to the quantity of specific "infective material in the water, the relations of the inmates to the "water, and their individual predisposition, was inevitable, and "accordingly took place."

Many of the later cases were no doubt due to secondary infection. How cholera was introduced into the asylum in the first instance was not satisfactorily made out, but it was suspected that it was brought by one or other of certain attendants who had come to the asylum shortly before the outbreak. It was ascertained as regards one of these, who

was engaged in December, and who had come from Hamburg had suffered from severe diarrhœa shortly after his arrival.

As soon as cholera bacilli were found in the River Saale authorities not only warned the people living lower down against the use of the water for drinking purposes, but positive it. Notwithstanding this, cholera appeared at four places alo Saale, and in each instance, the first case was attributed to the river water. The first place in which cholera appeared was village on the right bank of the Saale, about three miles below Three persons, of whom one died, were attacked with cholera 24th, a fourth case, due to secondary infection, followed on Ja On January 24th, a person living at Wettin, also on the rig the Saale, about 13 miles below Nietleben, was attacked with died. At Cröllwitz, situate on the left bank of the Saale miles below Nietleben, a person was attacked by cholera 30th, and this case was followed at intervals by five other of which died. The last of these outbreaks occurred at Letts also situate on the left bank of the Saale, about four m Nietleben. Here three cases occurred on the 2nd, 3rd, February respectively. Of these, one died.

In the foregoing account of cholera in Germany in the 1892–93. I have entered into a certain amount of detail on the etiologial interest of the outbreaks. As already stated diffusion must be regarded as part of the epidemic of 1892.

No. 15.

MEMORANDUM on the PROGRESS of the SANITARY SURVEY made in 1893, in Anticipation of CHOLERA; by Dr. BARRY.

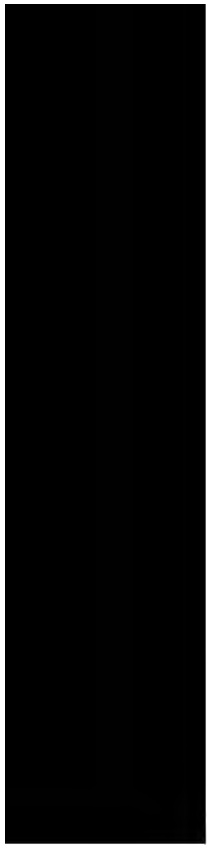
A SUMMARY of the results of the emergency survey undertaken in anticipation of cholera in the summer and autumn of 1892 of the Port and Riparian sanitary districts of England and Wales has already been published in the supplement to the Board's Report for 1892–93, pages 237–325. Early in 1893 a further complete and systematic Survey of the Ports and Riparian sanitary districts of this country was commenced, and continued throughout the year. This duty was, under my general supervision, entrusted to Mr. T. W. Thompson, Dr. Theodore Thomson, Dr. Copeman, Dr. Bulstrode, and Dr. Reece, of the permanent medical staff. During the year the whole of the 60 Port sanitary districts were inspected in the above sense, and 35 urban and 9 rural Riparian sanitary districts were similarly inspected, as to the exercise of their functions respecting shipping. Lists of these districts will be found in the following Tables I. and II., and their topographical position is indicated in the annexed Map I. The results, in detail, of the inspection of the whole coast line visited in connexion with the Cholera Survey during 1893–94 will appear in a separate volume.

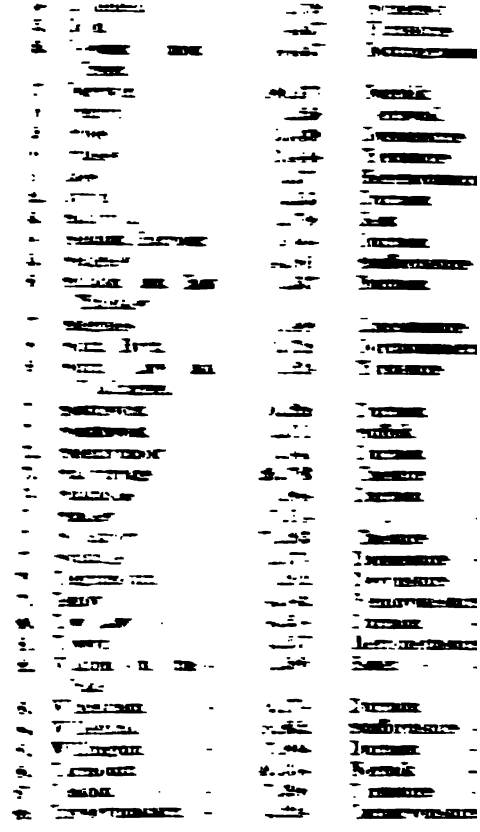
TABLE I.—PORT SANITARY DISTRICTS inspected during 1893.

Name of Port Sanitary District.	Inspector.	Name of Port Sanitary District.	Inspector.
1. Barnstaple	Dr. Bulstrode.	32. Littlehampton	Dr. Theodore Thomson.
2. Barry and Cadoxton	Mr. T.W. Thompson.	33. Liverpool	Mr. T.W. Thompson.
3. Beaumaris	Dr. Reece.	34. London	Dr. Theodore Thomson.
4. Blyth (River)	Mr. T.W. Thompson.	35. Lowestoft	Dr. Copeman.
5. Boston	Dr. Copeman.	36. Maldon	Dr. Reece.
6. Bridgwater	Mr. T.W. Thompson.	37. Milford	„ „
7. Bristol	„ „	38. Newhaven	Dr. Theodore Thomson.
8. Cardiff	„ „	39. Newport	Mr. T.W. Thompson.
9. Cardigan	Dr. Reece.	40. New Shoreham	Dr. Theodore Thomson.
10. Carnarvon	„ „	41. Padstow	Dr. Bulstrode.
11. Chepstow	Mr. T.W. Thompson.	42. Penzance	„ „
12. Chester	Dr. Reece.	43. Plymouth	„ „
13. Colchester	„ „	44. Poole	„ „
14. Cowes	Dr. Theodore Thomson.	45. Portsmouth	Dr. Theodore Thomson.
15. Dartmouth and Totnes	Dr. Bulstrode.	46. Preston	Mr. T.W. Thompson.
16. Deal	Dr. Theodore Thomson.	47. Rochester	Dr. Theodore Thomson.
17. Exeter	Dr. Bulstrode.	48. Sandwich	„ „
18 Falmouth and Truro	„ „	49. Scilly (Isles of)	Dr. Bulstrode.
19. Faversham	Dr. Theodore Thomson.	50. Southampton	Dr. Theodore Thomson.
20. Fleetwood	Mr. T.W. Thompson.	51. Sunderland	Mr. T.W. Thompson.
21. Fowey	Dr. Bulstrode.	52. Swansea	Dr. Reece.
22. Gloucester	Mr. T.W. Thompson.	53. Tees (River)	Mr. T.W. Thompson.
23. Grimsby	„ „	54. Teignmouth	Dr. Bulstrode.
24. Hartlepool	„ „	55. Tyne (River)	Mr. T.W. Thompson.
25. Harwich	Dr. Reece.	56. Wells	Dr. Copeman.
26. Hayle	Dr. Bulstrode.	57. Weymouth	Dr. Bulstrode.
27. Hull and Goole	Mr. T.W. Thompson.	58. Wisbech	Dr. Copeman.
28. Ipswich	Dr. Reece.	59. Workington	Mr. T.W. Thompson.
29. Kingsbridge	Dr. Bulstrode.	60. Yarmouth	Dr. Copeman.
30. King's Lynn	Dr. Copeman.		
31. Lancaster	Mr. T.W. Thompson.		

—URBAN SANITARY DISTRICTS of ENGLAND and WALES during 1893 as regards their SANITARY CIRCUMSTANCES ...NISTRATION.

...nitary ...t.	Population (Census 1891).	County.	Inspector.
...h -	6,725	Cardigan - -	Dr. Reece.
- - -	2,159	Suffolk - - -	Dr. Copeman.
- - - -	2,975	Northumberland -	Mr. T. W. Thompson.
... - -	3,809	Derbyshire - -	Dr. Wilson.
...la-Zouch	4,535	Leicestershire -	Dr. Fletcher.
...Maker-	13,379	Lancashire - -	Dr. Wheaton.
- -	23,498	„ - -	„ „
- -	2,045	Merionethshire -	Dr. Reece.
...ld -	1,773	Buckinghamshire -	Dr. Fletcher.
...shire -	16,996	Northumberland -	Dr. Wilson.
... - -	6,773	Monmouthshire -	Mr. E. Evans.
...re -	6,269	Durham - -	Dr. Wilson.
... upon -	13,377	Northumberland -	Mr. T. W. Thompson.
- -	12,539	Yorkshire - -	Dr. Wheaton.
...uckland	10,527	Durham - -	Dr. Sweeting.
- -	13,371	„ - -	Dr. Wilson.
- -	14,593	Lincolnshire - -	Dr. Bulstrode.
...and By- ...s.	14,239	Durham - -	Dr. Wilson.
...pon-Trent	46,047	Staffordshire - -	„ „
...hen -	10,264	Carmarthenshire -	Dr. Reece.
...pes-with- ...scoe.	4,306	Lincolnshire - -	Mr. T. W. Thompson.
... - -	8,175	Durham - -	Dr. Wilson.
...ham -	3,880	Yorkshire - -	Dr. Wheaton.
...n - -	12,982	Northumberland -	Dr. Wilson.
...th - -	1,410	Carnarvon - -	Dr. Reece.
...r - -	2,197	Norfolk - -	Dr. Copeman.
...e - -	3,095	Yorkshire - -	Dr. Wheaton.
... - -	8,891	Kent - - -	Dr. Theodore Thomson.
...r - -	37,404	Devonshire - -	Dr. Bulstrode.
...g - -	17,490	Durham - -	Dr. Wilson.
... - -	2,481	Yorkshire - -	Mr. T. W. Thompson.
...borough -	14,372	Lincolnshire - -	Dr. Fletcher.
...anchester -	2,095	Huntingdonshire -	Dr. Wheaton.
...esend - -	23,876	Kent - - -	Dr. Theodore Thomson.
...s Thurrock -	12,219	Essex - - -	Dr. Horne.
...t Clacton -	3,584	„ - - -	Dr. Reece.
...t Driffield -	5,703	Yorkshire - -	Dr. Wheaton.
...erfordwest -	6,179	Pembrokeshire -	Dr. Reece.
...on - -	979	Yorkshire - -	Dr. Wheaton.
...eford - -	20,267	Herefordshire -	Dr. Bruce Low.
...yhead - -	8,745	Anglesey - -	Dr. Reece.
...ole - - -	3,892	Cheshire - -	Dr. Fletcher.
...ughton - le - ...pring.	6,476	Durham - -	Dr. Wilson.
...instanton -	1,225	Norfolk - -	Dr. Copeman.
...eston - -	19,744	Derbyshire - -	Dr. Wheaton.
...dwelly - -	2,732	Carmarthenshire -	Dr. Reece.
...adgate - -	4,456	Durham - -	Dr. Wilson.
...nelly - -	23,937	Carmarthenshire -	Dr. Reece.
...ughborough -	18,196	Leicestershire -	Dr. Fletcher.
...uth - -	10,040	Lincolnshire - -	Dr. Bulstrode.





ABLE IV.—RURAL SANITARY DISTRICTS of ENGLAND and WALES inspected during 1893, as regards their SANITARY CIRCUMSTANCES and ADMINISTRATION.

Name of Sanitary District.	Population (Census 1891).	County.	Inspector.
1. Atherstone -	15,441	Warwickshire -	Dr. Wheaton.
2. Beverley - -	10,519	Yorkshire - -	„ „
3. Carmarthen -	23,873	Carmarthenshire -	Dr. Reece.
4. Daventry -	13,709	Northamptonshire -	Dr. Wheaton.
5. Driffield - -	13,140	Yorkshire - -	„ „
6. Easington -	36,782	Durham - -	Dr. Wilson.
7. Holywell -	29,843	Flintshire - -	Mr. E. Evans.
8. Houghton - le - Spring.	31,445	Durham - -	Dr. Wilson.
9. Narberth -	18,190	Pembroke and Carmarthen.	Dr. Reece.
10. Pembroke -	11,763	Pembrokeshire -	Dr. Fletcher.
11. Sculcoates -	8,786	Yorkshire - -	Dr. Wheaton.
12. Wharfedale -	7,551	„ - -	Dr. Horne.
13. Williton - -	15,470	Somerset - -	Mr. T. W. Thompson.
14. Woodbridge -	19,960	Suffolk - -	Dr. Copeman.

CHOLERA CIRCULAR to SANITARY AUTHORITIES in the METROPOLIS: June 22nd, 1893.

SIR,

I AM directed by the Local Goverment Board to call attention to their circular letter of 25th August last, in which, in view of the severe outbreak of cholera which was then occurring in Hamburg, they reminded Sanitary Authorities of the responsibilities and duties devolving upon them in connexion with the organisation of measures of precaution against the possible introduction of the disease into London.

I am now to forward, for the information of the Sanitary Authority, the accompanying copy of a memorandum by the Board's Medical Officer, from which it will be seen that there is reason for Sanitary Authorities preparing in advance to prevent the extension of any cholera that may be imported into their districts during the ensuing season.

The Board last year, in their circular already referred to, called attention to the powers vested in them under section 134 of the Public Health Act, 1875, and section 82 (1) of the Public Health (London) Act, 1891, to issue epidemic regulations imposing upon Sanitary Authorities the duty of making arrangements for the prevention and treatment of cholera. Those arrangements would comprise the appointment of committees for the purpose of carrying out the regulations, the divisions of the sanitary district into special areas, the appointment of medical visitors for the visitation of the poorer houses and the detection of cholera and diarrhœa, the supply of medical attendance and nursing, and of medicine and disinfectants, and the provision of dispensaries and of such additional hospitals and places of refuge as might be necessary for the several parishes and districts; the hospitals being provided for the reception of those cholera patients who could not properly be treated in their own homes, and the places of refuge for the lodgment of those persons not actually sick whom it might be right to keep under observation or to accommodate while their homes were either under disinfection or were devoted to sick persons who could not properly be removed.

As the Sanitary Authority are aware, the necessity for the issue of regulations of this nature happily did not arise last year, but in view of the possible recurrence of cholera during the approaching summer and autumn in continental ports with which this country is in rapid and close communication, the Board think it right that the Sanitary Authority should take into their early consideration the question of their readiness to meet any emergency that may arise. I am, therefore, to request that the Board may be informed, not later than the first week in the coming month, how far the preliminary action taken last year or since decided on by the Sanitary Authority may be regarded as enabling them without undue delay to perform the duties which would devolve on them in the event of the Board finding it necessary to issue regulations of the kind referred to.

I am, &c.

HUGH OWEN,
Secretary.

To the clerk to the Sanitary Authority.

ART. 2.—From and after the ninth day of August, one thousand eight hundred and ninety-three, and until we shall, by order, otherwise direct, dirty bedding, or disused or filthy clothing, whether belonging to migrants or otherwise, from France or from any foreign port in Europe rth of Dunkirk other than ports of Sweden, Norway, and Denmark, from any port on the Black Sea or Sea of Azov, whether in Russia, oumania, Bulgaria, or Turkey, or from any other port of Turkey in sia, shall be delivered overside, except for the purpose of disinfection destruction, nor landed in any port or place in England or Wales, xcept for the purpose of disinfection or destruction.

ART. 3.—Any such bedding or clothing delivered overside or landed or the purpose of disinfection shall not be taken out of the custody of he Officers of Customs until the same shall been disinfected by and at he cost of the person having control over the same, by means of steam under pressure in such manner as to secure the exposure of every part of every article, to a temperature of not less than 212° Fahrenheit, nor until the Medical Officer of Health shall have given a certificate to an Officer of Customs as to such disinfection, which certificate shall be in the following form :—

PORT OF .

"I hereby certifiy that the [*bedding or clothing*] delivered overside or landed at this port from the ship [*name of ship*] of or from [*port of sailing*], has been disinfected at this port in accordance with the provisions of Article 3 of the order of the Local Government Board dated the 5th August, 1893.

"(Signed)

Medical Officer of Health.

"Date 189 ."

ART. 4.—Any expenses incurred by the Commissioners of Her Majesty's Customs in watching articles delivered overside or landed for the purpose of disinfection or destruction under this order shall be defrayed by the person having control over the same.

ART 5.—If any such bedding or clothing so delivered overside or landed for the purpose of disinfection shall not, within a period of forty-eight hours after being so delivered or landed, be disinfected and certified as aforesaid, such bedding or clothing shall within twenty-four hours after the expiration of such period, be destroyed by the person having control over the same, with such precautions as may be directed by the Medical Officer of Health of the sanitary authoirty within whose jurisdiction or district the same may be found.

ART. 6.—Any such bedding or clothing so delivered overside or landed for the purpose of destruction shall, within twenty-four hours after being so delivered or landed, be destroyed by the person having control over the same, with such precautions as may be directed by the Medical Officer of Health of such sanitary authority as aforesaid.

ART. 7.—If the person having control over any bedding or clothing so delivered overside or landed for the purpose of disinfection or destruction shall make default in complying with the requirements of article 5 or article 6 of this order, such bedding or clothing shall be forthwith destroyed, at the cost of such person, by such sanitary authority as aforesaid, or by or under the direction of the Medical Officer of Health of such sanitary authority acting on their behalf.

No. 19.

CHOLERA (RAG) ORDER, 13th September, 1893.

To all Port Sanitary Authorities:—

To all Urban Sanitary Authorities;—

To all Medical Officers of Health of the Sanitary Authorities aforesaid;—

To all Officers of Customs;—

To all Masters of ships;—

And to all others whom it may concern.

WHEREAS we, the Local Government Board, by an order dated the 5th day of August, 1893, made certain regulations prescribing that from and after the 9th day of August, 1893, and until we should by order otherwise direct, no dirty bedding, or disused or filthy clothing, whether belonging to emigrants or otherwise, from France or from any foreign port in Europe north of Dunkirk other than ports of Sweden, Norway, and Denmark, or from any port on the Black Sea or Sea of Azov, whether in Russia, Roumania, Bulgaria, or Turkey, or from any other port of Turkey in Asia, shall be delivered overside, except for the purpose of disinfection or destruction, nor landed in any port or place in England or Wales, except for the purpose of disinfection or destruction;

And whereas in Article 1 of such order the terms "bedding" and "clothing" were defined as including such articles when torn up, but not including rags packed in bales and imported as merchandise;

And whereas doubts have arisen as to the meaning of the words "rags packed in bales and imported as merchandise";

And whereas the Commissioners of Her Majesty's Customs have signified their consent to the regulation herein contained so far as the same apply to the Officers of Customs:

Now therefore, we do, by this our order, and in exercise of the power conferred on us by section 130 of the Public Health Act, 1875, by the Public Health Act, 1889, and by section 113 of the Public Health (London) Act, 1891, and of every other power enabling us in this behalf, make the following regulation and declare as follows:—

The above-mentioned words "rags packed in bales and imported as merchandise" mean rags compressed by hydraulic force transported as wholesale merchandise in bales surrounded by iron bands, and with

No. 20.

REPORT of the BRITISH DELEGATES to the INTERNATIONAL SANITARY CONFERENCE of DRESDEN.

To the Right Hon. The Earl of Rosebery, K.G.,
Her Majesty's Principal Secretary of State for Foreign Affairs.

MY LORD, Dresden, April 18, 1893.

WE have the honour to report that, in accordance with your Lordship's instructions of the 7th March last, we attended the International Sanitary Conference held at Dresden. We were present at all its meetings, and took part in all its deliberations.

The countries represented were: Germany, Austria-Hungary, Belgium, Denmark, Spain, France, Great Britain, Greece, Italy, Luxemburg, Montenegro, the Netherlands, Portugal, Roumania, Russia, Servia, Sweden and Norway, Switzerland, and Turkey.

The printed Proceedings of the Conference are submitted separately.

The first meeting was held on the 11th March 1893, and this, and the three subsequent meetings, were mainly taken up by formal statements, by the different Delegates, of the Laws and Regulations in force in their respective countries, and of their application during the epidemic of last year. Some of the statements were coupled with the expression of the hope that the labours of the Conference would result in a relaxation of the restrictions to which, in many parts of Europe, traffic, whether of individuals or of merchandise, had hitherto been exposed.

At the fourth sitting we explained the policy which, for many years past, had been carried out in England with regard to the prevention of cholera, we showed the results of our practice, and, after a brief account of the circumstances which attended the importation of cholera into England last year, we pointed out that the disease had in no case extended beyond persons arriving from abroad. And at the ninth sitting, when the Conference had under discussion the Regulations for arrivals at sea frontiers, we described in some detail the application of our Cholera Regulations to English sea-ports.

To facilitate the labours of the Conference, three Committees were appointed to consider the Interrogatory submitted by the Austro-Hungarian Government, and to submit conclusions for discussion by the full Conference. Such conclusions as were adopted by the Conference were subsequently embodied in a Convention. We were represented on each of these Committees.

The First Committee was concerned with the duties imposed on a Government when cholera appears in its country. The Second Committee dealt with the measures which devolve on a Government to prevent cholera from spreading into its own territory from abroad, or from one part of its own country to another. These subjects were treated under three headings, namely, measures on land, measures on rivers, and measures by sea. The Third Committee was concerned with traffic up the Sulina mouth of the Danube.

The First Committee held four sittings. It dealt, in the main, with the information as to the existence of cholera, which each Government should secure for itself and communicate to other countries; with the reciprocal negotiations to be made between countries concerning the spread of cholera and the means taken to stay its diffusion; with the

conditions under which any area should be regarded as infected (
taminé "); and lastly, with the measures to be adopted in or
prevent the restrictions being imposed against an entire country
only a limited portion of it is infected.

A number of conclusions were arrived at by this Committee
with certain modifications, they were adopted by the full Confer
a later sitting. They embody the principle of the notification b
countries of cases of cholera, and they aim at preventing certa
reasonable measures of restriction against countries in which
has appeared. We assented to them; but as regards a proposal
effect that "les cas restés isolés ne feront pas nécessairement
d'une notification," we expressed the opinion that the limitation
notification to a so-called "foyer" would encourage a secrecy with
to the onset of cholera which might materially affect the value
notification, and that under any circumstances, England would m
her present practice of making public every occurrence of cholera
country.

The desire to limit the notification between countries to so
"foyer" was, however, very general; the limitation was neces
was alleged, to avoid exposure to restrictions unnecessary in the
isolated attacks of the disease; and, under the circumstances,
not press our objections to the proposal. No satisfactory definitio
what constituted a "foyer" could be arrived at.

The Second Committee had to deal with by far the largest num
the subjects of Austro-Hungarian "Interrogatory." Thus, their l
included the definition of infected and healthy districts, the appli
of disinfection, and the restrictions to be imposed on traffic, whet
merchandise or of persons, and whether by land, by river, or by sea
a view to the prevention of cholera.

No district is to be considered infected, or to be the subje
restriction, until it is held to be the seat of a "foyer" of cholera, and
restrictions are to cease, subject to the adoption of certain measure
disinfection, as soon as five days have elapsed since the last occurre
of or death from cholera. But, whilst this is the case, the limitation
these restrictive measures is only to apply to countries the Governme
of which take steps to prevent the exportation of articles from the infe
district which are deemed to be "susceptible," *i.e.*, capable of tr
mitting cholera. We pointed out that, as yet, Great Britain had n
been placed in a position rendering it necessary for her to im
restrictions on any articles exported from her territory for the pur
of preventing extension of cholera abroad; but as the conclusio
question is concerned only with articles coming from an actually infe
district, and as it is limited to the few articles which the Conven
defines as "susceptibles," we did not insist on our objections.

The term "susceptible" has indeed, under the Convention, a
limited application. It relates only to articles of clothing and bed
which have been in use, and to rags as defined by the words "chiff
and "drilles." But some very important exceptions are made
regard to articles which in our country come under the term "rags."
Thus, it was decided that "rags" sent in bulk, and under the custo
conditions which apply to rags as an article of merchandise, shall no
deemed "susceptible," and should therefore be free from all restricti
the same exemption was made to apply to clean clippings and wa
similar articles, as also to woollen rags coming under the trade de
tions "Kunstwolle" and "shoddy."

Some considerable discussion took place as to these exemptions,
only in the Committee, but in Sub-Committee, and at more info

gatherings of which there are no records. As regards the interchange of views which took place at these meetings, it will suffice to say that the leading Technical Delegates present, including Professors Koch, Brouardel, and Proust, were unanimously of opinion that in no case had cholera been traced to "rags" in the form in which they are now exempted, and that risk of their conveying the infection of cholera was so remote as to justify the exemptions specified.

It was further decided that the transit through a country even of merchandise classified as "susceptible" must not be prevented if the goods are so packed that they cannot be handled on the way; that merchandise ought not to be prevented entering a country even if it had passed through an infected district, provided it had been so conveyed as to avoid contact with infected things; that no merchandise should be subject to restrictions if it could be shown that it had been despatched from an infected country not less than five days before the commencement of an epidemic; and that no merchandise ought to be retained in quarantine at land frontiers.

At one stage of our proceedings considerable difficulty arose in regard to disinfection. There was formally submitted to the Committee a proposal to the effect that the disinfection of dirty (*i.e.*, unwashed) linen which formed part of the luggage of passengers should be obligatory at the frontiers of all countries. The French Representatives maintained very strongly that this should be accepted as a definite obligation, whereas a number of Delegates, including those of Germany, Austria-Hungary, Italy, Belgium, Switzerland, and Great Britain, contended that such a practice was useless except where the articles were infected. In opposition to the alleged experience of France, that there had been no importation of cholera at her frontiers, where the practice in question had been carried out, we were able to speak to a precisely similar immunity in England, where no such action had been resorted to as regards the vast numbers of persons reaching our shores from infected countries. The matter having been discussed at great length, we submitted an amendment to the effect that such articles should be disinfected provided the local authorities had reason to regard them as having been contaminated by choleraic discharges, but this was at once met by a demand on the part of the French Delegation to the effect that a vote should be taken on the question whether this disinfection was in all cases to be compulsory or permissive. Of eighteen Delegations present, thirteen voted that it should be permissive; four, namely, France, Greece, Russia, and Turkey, that it should be compulsory: Portugal abstained.

At the opening of a sitting of the Committee on the following day the French Delegation proposed to render it obligatory to disinfect all dirty linen and other articles, provided they came from a district declared to be infected. Although this proposal was in effect the same as that which, after lengthened consideration, had been rejected in so definite a manner on the preceding day, the majority of the Delegations present had come prepared to accept it, the result being that it was adopted on behalf of all the Powers represented except Great Britain.

Having regard to the contradictory nature of the proceedings of the Committee on this subject, and to the overwhelming vote of the previous day, we felt that so sudden a change of front could have no real influence in the direction of imposing on all nations alike this useless proceeding, and, as we shall have occasion to point out under the head of maritime restrictions, we had eventually reason to find that our judgment was correct.

After deciding on a number of conclusions affecting the passage of trains and persons across land frontiers in such manner as to secure a

diminution in the restrictions which had been heretofore so ex resorted to, it was decided that the regulation of traffic along common to two or more countries should be left in each case respective riverain States; the Committee further recommen adoption the Regulations drawn up by the German Government subject, which had in practice been found to give good results du epidemic of 1892.

The subject of maritime measures and arrivals by sea havi now reached, a Sub-Committee was formed to prepare answers portion of the "Interrogatory" which related to arrivals at se These having been drawn up, were submitted in the form of pro propositions at the fifth sitting of the Second Committee. prescribed, amongst other things, the treatment to which three of vessels, namely, "infectés, suspects, et indemnes," were subjected.

The first proposal related to the definition of the terms " infecté," "navire suspect," and "navire indemne."

It was decided that a vessel should be held to be infected if the cholera on board, or if a case had occurred on board within seve before arrival in port. As regards such vessels, three Regulation laid down. In the first place, persons actually sick of cholera were landed, a condition to which we assented. By the second Regula was laid down that all other persons on board were also to be if possible, and then subjected to a process of "observation" for a not exceeding five days, reckoned from the date of the occurrence last case.

Having regard to the fact that in a subsequent Regulation d with suspected vessels the term "surveillance," and not "observa was used, it was clear that the intention was to subject healthy pa gers landed from an infected vessel to a definite detention in a lazaret or similar institution; in short to carry out what is known a "quarantaine d'observation." We therefore felt it our duty to exp that, as the result of a lengthened experience, it had been decide England that compulsory detention should be limited to those who actually sick on arrival, and that we trusted to inland Sanitary Autho to maintain such sanitary conditions and arrangements as would e them to prevent the extension of the disease should any case of ch arise subsequent to landing. And we added that our assent t Regulation in question could only be given on the distinct understan that the "observation" would, in the case of England, be limited t supervision to which passengers arriving from infected vessels subjected for a few days in their own homes by the local San Authorities. This reserve we repeated at a subsequent sittin the full Conference, and it was inserted in the "Protocol Signature."

The third Regulation is concerned with the disinfection of article of certain portions of an infected vessel. This Regulation, as first sented to the Committee, was so framed as to make it compulso disinfect all the unwashed linen in the trunks of passengers arrivi a vessel on which a case of cholera had occurred within the pre seven days. In short, it practically repeated the requirements al referred to in connexion with the subject of disinfection, and i strongly insisted on by the French Delegation. The extension o obligation to arrivals by sea was very distasteful to the German D tion, and after an unsuccessful attempt on their part to get the F Delegation to modify the proposal, they announced in Committe

they could not accept it. We supported them, adding that our experience in England over a long term of years was such as to show that the requirement was unnecessary, and that, under the circumstances, we absolutely declined to be bound by any such obligation merely because another country considered it necessary in her own interests. In the end the obligation stands as limited to such articles as, in the opinion of the local Sanitary Authority, have been actually contaminated by choleraic matters. In short, the proposal made by the British Delegation when the subject was first discussed in connexion with disinfection was in substance accepted, and the corresponding conclusion already referred to in dealing with that subject was also altered in like manner. In their present form, both regulations closely correspond with the actual practice adopted in England.

Suspected vessels were next dealt with. They are defined as vessels on which cholera has occurred either at the moment of leaving the port of departure or during the voyage, but on which no fresh case has arisen for seven days. These vessels are subjected to a medical visit, to disinfection of articles actually infected, and to certain precautions concerning bilge and drinking water. A recommendation is appended as to the advisability of maintaining under supervision ("surveillance") the crew and passengers for a period of five days. As regards this suggestion, which is repeated as to vessels styled "indemnes," we explained that the practice was not likely to be deemed necessary in England, but as it came as a recommendation only, and was held to be of value in other countries, we should raise no objection to it.

A further suggestion in a like recommendatory form relates to some supervision over the movements of the crew.

Vessels styled "indemnes" were next discussed. They are defined as vessels on which there has been no death or attack from cholera. Such vessels are at once to have free pratique, even though they may have come from an infected port; and it is laid down that the regulations to which they can be subjected when coming from an infected port shall, in no circumstances, exceed those concerning suspected vessels.

The definitions of the terms "infecté," "suspect," and "indemne" agree with those in the Convention of Venice.

A few other general conclusions were adopted, such as the power to enact special regulations in the case of vessels which carry emigrants, which are overcrowded, or are in a bad sanitary condition.

There follow certain important conclusions as to merchandise. Thus, it was decided that goods arriving by sea were to be submitted to no other restrictions, whether prohibitory or relating to such matters as disinfection, than were permissible at land frontiers.

It was also resolved that any ship declining to submit to the Regulations affecting the three classes of vessels above referred to should be free to resume her journey without detention, but that any such vessel could land her merchandise under certain conditions, which will not, we trust, be regarded as needlessly irksome; and, further, that any passengers willing to submit to the Regulations affecting arrivals at the port should also be free to land.

It was further laid down that every country should provide on each of its coasts at least one port so fitted and adapted as to be able to receive vessels whatever their sanitary condition.

Meanwhile, the Third Committee was engaged on its labours. The question before it was, in substance, as follows: What sanitary restrictions should be imposed on navigation in the Sulina mouth of the Danube, and how far are the Rules of the Convention of Venice applicable to this particular case?

At the second meeting of the Committee the principal Russ
gate brought forward a set of Rules drawn to meet, accordi
view, the special requirements of the steamers trading betwee
and the port of Reni on the Pruth, in the Russian Province of
bia, which is reached from the Black Sea by the Sulina mou
Danube. They also professed to offer adequate security to t
manian Government, to whom the maintenance of the best w
state of purity is a capital interest, as a portion of the riveri
tions—more especially the inhabitants of the town of Sulin
their drinking water from the stream.

It was the Russian contention that this difficulty would be a
grant to the Odessa steamers of leave to mount the Danube to
quarantine," under guarantee of a set of restrictions to be ob
the Black Sea by Russian medical authority, and during the
the river "in quarantine" by the Roumanian sanitary police.

The Russian Delegate's proposals were elaborately drafted
give effect to this scheme. We do not quote them in detail,
were rejected by M. Ghika, the Representative of Roumania, i
which dealt exhaustively with the points at issue by every
resource of administrative, topographical, statistical, and
argumentation.

In objections of the last-named category lay the onus of M
refusal. He maintained, as decisive for his Government, t
Russian proposals failed to provide those absolute safeguards
maintenance of the purity of the river against contamination by
dejections from passing steamers, which that Government re
vital for Roumanian interests.

In presence of this apparent deadlock, the Committee ch
Scientific Sub-Committee to advise on the points at issue, and a
conditions, if any, under which the principles adopted by the Con
of Venice in the case of the Suez Canal might be susceptible of
cation to the Sulina channel. The Sub-Committee included
Technical Delegates of France, Germany, Italy, Roumania, Turkey,
Great Britain. Diplomatic Representatives of Austria-Hungary
Russia were invited to attend its meetings, and supply such inform
on topographical or other local details as might be required.

In the discussion that ensued, the experience of Germany during
recent cholera epidemic, as to the pollution of the rivers in rese
domestic water supplies, was carefully considered. The Sub-Com
decided that between the circumstances of the Suez Canal, with i
and brackish water and arid shores, and those of the Sulina ch
with a population drinking the fresh water from the river, no p
could be drawn as regards the transit "in quarantine" by p
infected vessels. Thereupon a set of rules resting on an e
different basis was drawn up, and submitted to the Third Commi

The measures in question relate exclusively to vessels arriving
infected ports. They are, in substance, as follows:—

All ships of that category reaching the mouth of the Danube
subjected to daily medical inspection for a period which, in the a
of any occurrence of cholera on board, shall not exceed three da
infected linen to be disinfected; certain securities to be taken in
to the ship's drinking water and bilge water. Further, these an
allied precautions are to be carried out, and eventually repeated,
ing to the state of health on board, at sanitary stations to be est
up the river; while all vessels ascending the Danube from Sulin
comply with certain general regulations, such as the avoidance

crowding, &c., which aim at the maintenance of a reasonable standard of healthiness on board.

This scheme, being laid before the Third Committee, and some amendments of small importance having been adopted, was accepted by the Delegates of Russia and Roumania. Its conclusions were approved by the Committee, and recommended to the full Conference, which thereupon passed them by an unanimous vote. Such was the solution of that which at one time promised to be one of the most difficult problems of the "Interrogatory;" its attainment was chiefly due to the intervention of the scientific Delegates.

We have thus discussed the main conclusions adopted by the Conference, and embodied in the Convention. Some of them involve restrictions in excess of that which, according to English experience, is necessary, or even desirable, for the prevention of cholera. But as regards land and maritime traffic generally, they approach more closely to our English standard than any rules that have ever before been accepted, or even suggested, at any similar international gathering; they were only adopted by some of the consenting Delegations after repeated argument. Thus it was necessary constantly to point to the baneful influence of restrictions which give a sense of false security, and hinder the adoption of an efficient sanitary administration, which constitutes the only true safeguard against cholera. If the new measures are so carried out as neither to trespass beyond the limits of the spirit or the letter in which they are conceived, some substantial advance in the direction of the freedom to traffic both by land and by sea, and of the maintenance of a higher standard of public health in all the countries represented, will, we venture to hope, have been achieved.

We availed ourselves of every opportunity to limit the restrictions which, under the Convention, may be imposed on vessels to which some suspicion of cholera attaches. The Regulations as to this, as they now stand may be regarded both as defining a maximum and as permitting a minimum of restrictions. As regards even vessels deemed to be actually infected with cholera, the maximum restriction to which they may be subjected, if they elect to enter a given port, will involve a detention of the hitherto healthy passengers for a period not exceeding five days, as reckoned from the date of the last occurrence of cholera on board. This maximum, which does not necessarily involve the vessel itself, compares most favourably with the length of detention to which both vessels and passengers have hitherto been subjected in many foreign ports. The minimum of restrictions, which is held to be obligatory, in the case of vessels actually infected, complies, with one exception only, namely, that relating to that which is in effect a quarantine of "observation" as applied to healthy persons landing from infected ships, with the restrictions which it has long been deemed necessary to apply to such vessels arriving in English ports. And it thus happens that, subject to our reserve in the matter named, the adoption by England of the conclusions arrived at will involve no alteration whatever in the cholera Regulations under which our ports are at present administered

It must also be remembered that the number of British ships which, by reason of their having recently had cholera on board, would come within the restrictions applicable under the Convention to (1) infected vessels or to (2) suspected vessels, must be extremely small; whereas vessels held to be (3) "indemnes," will, notwithstanding the fact that they may have come from an infected port, immediately receive free pratique.

It will be observed that only three classes of vessels are referred to in the Convention, namely the "infectés," "suspects," and "indemnes,"

Appx. A, No. 28.

Report of the British Representatives to the Sanitary Conference, Dresden, 1893.

all of which have some relation to cholera either on board or in the ... from which they have sailed. It was not thought necessary ... Conference in any way to refer to vessels that were in no way ... any occurrence of cholera, it being assumed that since the ... arrived at were concerned with cholera only, no other cases ... specified could be regarded as in any way coming within any ... restrictions allowed by the Convention. This view was accepted ... notwithstanding, we thought it advisable to make a definite ... which is included in the proceedings of the last sitting of the Conference to the effect that it must obviously be assumed that no vessels other than those having had cholera on board, or having come from a ... port, would fall under any of the provisions of the Convention.

As we have already pointed out, the Convention offers ... regards the landing of merchandise which we trust will lead to ... commerce from some of the vexatious restrictions to which ... hitherto been so often subjected. It constitutes a considerable ... towards freedom from unnecessary restrictions. Though the ... natives of certain Powers felt it their duty to adopt an attitude ... opposition to the progress involved, it is noteworthy that they did ... so in an apologetic tone: some of them expressing a hope that ... long their own Governments would find it possible to follow the ... of Powers represented at the Conference. On no single occasion ... any proposal made to maintain quarantine in its more stringent ...

The Convention, which we have now the honour to submit ... Lordship's consideration, was signed by the Delegates of the following countries, acting as Plenipotentiaries, namely:—Germany, Austria-Hungary, Belgium, France, Italy, Russia, Switzerland, Luxemburg, Montenegro, and the Netherlands.

We also have the honour to enclose a copy of the "Protocol of Signature," recording the final declarations of the various Delegates in regard to the Convention. In that Protocol we renewed the reservation we had already expressed, stating that in the United Kingdom the "observation" of healthy persons leaving infected ships will not go beyond a medical supervision carried out in their house. No exception was taken to this reservation.

We also made a statement, for insertion in the "Protocol of Signature," that we would submit the Convention to the consideration of Her Majesty's Government.

The announcement that the Convention was not to be signed ... on behalf of Her Majesty's Government produced a certain feeling of disappointment among our foreign colleagues, the more so as many of its provisions had been specially framed to meet our views; we therefore explained that our instructions did not admit of our taking this step, as the final text of the instrument had not been settled in time to allow of our referring it to your Lordship. Under the circumstances, however, we felt ourselves justified in expressing our personal satisfaction at the great advance which had been made, and, generally, at the provisions of the Convention. Looking to the terms of this instrument we trust that we have in some measure attained the object which Her Majesty's Government had in view in appointing us to act as their Representatives at the Dresden Conference.

We have, &c.

(Signed) GEORGE STRACHEY
R. THORNE THORNE
H. FARNALL

APPENDIX B.

No. 1.

Further Report on the Etiology of Typhoid Fever; by Dr. Klein, F.R.S.

I.—Differentiation of the Typhoid Fever Bacillus and Bacillus Coli.

In my report for 1892–93, I showed that the "typhoid bacillus" is, from its relations with the tissues (mesenteric glands and spleen) in enteric fever, very probably the *vera causa* of this disease. I pointed out that the view put forward by several French authorities* as to the probable identity of the common saprophyte, bacillus coli, and the "typhoid bacillus," did not get support from the large series of experiments made and recorded by me respecting these microbes. And I showed that the typhoid bacillus obtained by me from the tissues of enteric fever and the bacillus coli obtained from the healthly human intestine, can be differentiated the one from the other with comparative facility; that their fundamental differential characters are:—

(*a.*) The typhoid bacillus is longer and more motile than bacillus coli, and grows distinctly more slowly in gelatine plate cultivation than that microbe.

(*b.*) The typhoid bacillus taken from the mesenteric glands and spleen or from the dejecta of a case of typhoid fever, and grown (as a shake culture) in the depth of beef broth gelatine, never forms gas bubbles; whereas bacillus coli taken from the intestinal contents invariably forms gas bubbles under like conditions of culture.

(*c.*) The typhoid bacillus when growing in skim milk at 37° C. never produces curdling of that fluid, whereas bacillus coli curdles milk in two or at latest in three days.

(*d.*) The typhoid bacillus growing in alkaline beef broth at 37° C. does not form indol, whereas bacillus coli under like conditions of culture gives distinct indol reaction after four, five, or more days' growths in that medium.

With a view of ascertaining how far the differential characters of the typhoid bacillus and of bacillus coli are retained or are lost when these microbes are submitted for equal length of time to the same conditions outside the animal body, I instituted, in 1893–94, experiments as follows:—

(*a.*) *Behaviour of the typhoid bacillus and of bacillus coli in tap water and in distilled water.*

Two sterile flasks, No. 1 and No. 2, were charged with ordinary tap water of the laboratory. Other two sterile flasks, Nos. 3 and No. 4, charged with the same water were sterilised by boiling. And two

* Arloing, Roux, and Rodet.

additional flasks, Nos. 5 and 6, having been charged with sterile distil water (the water was distilled into the flasks in the laboratory), w further sterilised by boiling. Each flask was made to contain ab 250 c.c. of fluid. They were then dealt with thus:—

Flasks Nos. 1, 3, and 5 received each a platinum loopful of baci coli from a gelatine culture derived by plate cultivation dire from the normal human intestines.

Flasks Nos. 2, 4, 6 received each a platinum loopful of typh bacillus from a gelatine culture derived from the spleen of a typ case of typhoid fever that died at the commencement of the th week.

From day to day for the several weeks during which these flasks w kept at an ordinary temperature, plate cultures were made of contents of each flask, and the resulting colonies were tested sub-culture in regard to the four groups of morphological a cultural features (*a*, *b*, *c*, *d*), already referred to.

As a result, it was found that just as in the original cultures wh the organisms of experiment were derived, so also from each of water flasks inoculated from them, *the two organisms, viz., bacillus and the typhoid fever bacillus, retained their differential charac unimpaired.* As long as any colonies were obtainable from the fl of either set, the growths were easily distinguishable as those of baci coli and of typhoid bacillus respectively. There was never any in cation whatever of modification, morphologically or culturally, of eit microbe.

Incidentally a notable fact was observed in the course of th experiments, namely, that both the bacillus coli and the typhoid bacill persisted considerably longer in the flasks that contained distilled wat than in those that contained tap water. In the flasks containin distilled water both organisms, after gradually decreasing in numb until the sixteenth day, began, especially about the twentieth da steadily to increase again; so that by the end of the month, and eve later, colonies of each sort were obtained from their respective flasks a readily and as numerously as in the first few days of the experimen On the other hand, in the flasks containing tap water (whether sterilis or not sterilised) experiment could not be carried beyond 16 days, sin by that time the microbes introduced had become in each instance diminished in number as to make it difficult to recover them by pla cultivation, even when using for each plate as much as one cubic cent metre of water. I do not enter into minute detail of my recent exper ments on this subject, as I am proposing to further study the behavio of the typhoid bacillus and of bacillus coli in waters of various characte and under various conditions. For my present purpose it is enough insist that in all the experiments which I have, so far, made there not, when they are grown in water, the slightest evidence of alterati in the fundamental cultural characters of either the bacillus coli or the typhoid bacillus.

That both sorts of bacillus—the typhoid bacillus and bacillus coli can subsist in natural waters is indeed demonstrable from the fa respecting samples of water derived from particular localities in wh outbreaks of typhoid fever have been found due to the public wat supply. Two such localities which have recently come within cognizance are Worthing and Rotherham. In Dr. Theodore Thomso report on the Worthing epidemic, the results of my bacteriosco analysis of the incriminated water are given in detail, and it is theref

unnecessary to refer to them here.* But there are some general considerations involved to which it will be convenient to refer at this stage.

It is necessary to bear in mind that that Worthing water, having been copiously polluted with sewage, contained bacillus coli in abundance. When I say in abundance, I mean that, examining *large quantities* of the water, there was no difficulty in discovering in it, by plate culture, colonies which, on further examination by sub-culture, presented all the fundamental characters of bacillus coli. Of course, when only small quantities of a suspected water, one c.c. or less, are used for plate cultivations, bacillus coli may easily be missed. For be it bacillus coli or the typhoid bacillus that is in question, whenever drinking-water is polluted with human excrement, it always is (unless the water is exceptionally fouled) a relatively extremely limited pollution; the pollution is, moreover, as a rule intermittent, and the bulk of water as compared with the polluting matter is extremely large. In order, therefore, to discover bacillus coli or the typhoid bacillus in such water, it is obviously necessary to subject large volumes of it to examination. The method adopted by me is briefly this: — Large volumes of water (1,600–2,000 c.c.) are driven through a Berkefeld filter, and the particulate matter left on the filter is then subjected to plate culture, each plate receiving the particulate matter of 150–250 c.c. of the original water. The gelatine used for the plate cultivations is, however, previously phenolated for the purpose of inhibiting, or retarding for some days, the growth of the many saprophytes—liquefying and non-liquefying—which may occur in water, *i.e.*, bacillus fluorescens liquescens, bacillus mesentericus, proteus vulgaris, various species of cocci, &c. Meanwhile, colonies of bacillus coli or of typhoid bacillus, which organisms are not affected by this addition of phenol, have a chance and leisure to make their appearance in the plates.

When stating above that both from the Worthing and Rotherham water bacillus coli was recovered by cultivation, I mean a bacillus which in morphological and cultural respects possessed *every one* of the features mentioned above as characteristic of this organism. This is important to bear in mind, because there commonly exists in waters—I, myself, have come across it several times in waters derived from a variety of localities—a bacillus which resembles in some respects bacillus coli, but which is, nevertheless, to be differentiated from it. The water bacillus in question resembles bacillus coli in the mode and aspect of its growth in gelatine plates, on the surface of gelatine, and in gelatine in stab culture. It does not liquefy the gelatine; it is like bacillus coli, an oval or short cylindrical rod, occasionally forming a short filament, but it is distinctly more motile than bacillus coli; it does *not* form gas-bubbles in shake culture; it does *not* curdle milk, and it gives only slight indol reaction. On account of these differences it cannot be considered as the typical bacillus coli. It is this same bacillus which Weichselbaum also recognised in waters, and which he, too, distinctly differentiates from bacillus coli.

In both these waters—Worthing and Rotherham—the true and typical bacillus coli was demonstrated. And in addition, the typhoid bacillus was found in a few colonies. As to the latter, I mean a bacillus which presented the fundamental characters exhibited by the typhoid bacillus when it is obtained from the spleen of a case of typhoid fever. The bacilli in question were distinctly cylindrical, with a great tendency to form filaments. They were conspicuously motile, grew slowly in gelatine

* As to Worthing, see pp. 78–80 of present Vol.

pigs, did not form gas bubbles in gelatine shake culture, did not coa
milk, and did not form indol in alkaline broth. In a word, the colo
that were isolated from the Worthing and Rotherham waters, and vi
were identified as bacillus coli and as bacillus of typhoid respecti
were such as possessed all those characters that I consider distinctiv
the one and the other microbe.

Having thus obtained bacillus coli and the typhoid bacillus freely b
sources other than the human (or animal) subject, I sought to ascer
whether these organisms, of different pedigree, so to speak, but t
samples experimented with last year, would breed true under identi
conditions. Accordingly, these samples of bacillus coli and of typh
bacillus that I had obtained from the water supplies in question, were
studied by sub-culture in various media for more than 30 renews, sim
taneously and concurrently with stock cultures of bacillus coli and
typhoid bacillus of direct human origin; and, as a result, it was fou
that they showed at no time any alteration in their cultural charact
For instance, in their behaviour in gelatine shake culture, in milk, a
in broth, bacillus coli from normal human intestine, from Worthing
from Rotherham water, and the typhoid bacillus from the spleen
typhoid fever, and from Worthing and from Rotherham water, sho
from first to last in each instance the fundamental characters wh
distinguish the two sets of bacillus.

A further point in connexion with this question of fixity of type
the above organisms was next tested. As was pointed out in my rep
for 1892-93, intraperitoneal injection, in sufficient doses, of guinea-pi
with either the bacillus coli or the typhoid bacillus (using the bod
themselves, not their products, for injection), causes rapid death fr
intense peritonitis with copious multiplication of the bacilli in t
peritoneal exudation; and, as was also there pointed out, intraperito
injection of this exudation in further guinea-pigs causes the sam
intense peritonitis with copious multiplication of the bacilli. I wish
therefore, to see whether by carrying the experiment through a prolonge
series of guinea-pigs—one series for bacillus coli, another series for th
typhoid bacillus—the bacilli in the peritoneal exudation of the last animal
of each series still presented unaltered the essential characters of the
microbe that had started the series. I initiated, therefore, series o
experiments as follows:—

Bacillus coli series.—Guinea-pig No. 1 was intraperitoneally injecte
with a large dose (one-third of a culture tube) of the bacillus co
scraped off from the surface of a gelatine culture. This animal die
within 20 hours, and presented copious peritoneal exudation. With t
peritoneal exudation I injected intraperitoneally another guinea-pig
No. 2, which also died within 20 hours with copious peritoneal exudation
With exudation material from No. 2, I injected guinea-pig No. 3
from No. 3 I injected No. 4; and so on until six guinea-pigs had bee
injected—the last of which, like the first, died in 20 hours with copiou
peritoneal exudation.

Of every one of these six guinea-pigs, the peritoneal exudation wa
used for making plate cultivations, and the colonies arising therein were
tested microscopically and by sub-culture: and with the result that i
the peritoneal exudation of every one of these removes bacillus col
retained its morphological and cultural characters absolutely unaltered

Typhoid bacillus series.—This was carried out on exactly the same
lines as the other. All the guinea-pigs died as before, and cultures
made from the peritoneal exudation of each one of them yielded the
typhoid bacillus, presenting, at last as at first, exactly the same morpho
logical and cultural characters.

So that neither bacillus coli nor the typhoid bacillus by its passage through the peritoneum of the guinea-pig alters in the slightest degree its distinctive characters. Each remains ultimately as well differentiated from the other as at the outset.

II. The Typhoid Fever Bacillus in Relation with the Monkey and the Calf.

I next proceeded to test, on monkeys and on calves, cultivations of the typhoid bacillus derived from humam cases of typhoid fever, with a view of ascertaining whether any specific pathogenic action could be thus established in these animals. As will be remembered from my 1892–93 report the action of the typhoid bacillus on rodents, whether it be injected subcutaneously or intraperitoneally, is *not* of specific kind; it is of exactly the same nature as produced by other microbes, *e.g.*, bacillus coli and proteus vulgaris. Experiment therefore with the calf, and especially experiment with the monkey, was determined on.

A.—*Monkeys subcutaneously injected with the typhoid bacillus.*

Experiment I.—Two Rhœsus monkeys, Nos. 1 and 2, were injected subcutaneously in their groins with gelatine culture of the typhoid bacillus, from the spleen of an enteric fever case, established 48 hours previously. The growth was scraped off from the gelatine and mixed with a few c.c. of sterile salt solution, each animal receiving one Pravaz syringeful of this mixture.

Some of the main facts of this experiment are exhibited in the subjoined table:—

Date.	Temperature, in Degrees Centigrade, taken in the Evening.		Remarks.
	Monkey No. 1.	Monkey No. 2.	
Day before inoculation -	39·5	38·8	——
Day of inoculation -	39·6	39·6	——
1st day after inoculation	40·2	39·	Both eat well, and are lively.
2 days " "	40·	39·4	" "
3 " " "	39·6	39·6	" "
5 " " "	39·2	—	No. 2 found dead; No. 1 quite well.
6 " " "	39·2	—	No. 1 eats well and is lively.
7 " " "	39·	—	" "
8 " " "	39·	—	" "
9 " " "	39·1	—	" "
10 " " "	39·	—	" "
12 " " "	38·8	—	" "
13 " " "	40·3	—	" "
14 " " "	39·6	—	" "
15 " " "	39·6	—	" "
16 " " "	39·8	—	" "
17 " " "	40·	—	" "
19 " " "	38·8	—	" "

The animals showed, except a slight rise of temperature in No. 1 on the day following inoculation, no change in general health for several days; but they both had at the end of 48 hours slight swelling about the seat of inoculation, which gradually increased; in monkey No. 2 it led to the formation of an open suppurating sore. In the evening of the fourth day

this monkey became very quiet, and refused its food; on the fifth d
was apparently ill, very quiet, did not move, and did not take any food
was found dead on the following morning. The post-mortem exa
tion showed: an open sore in the inguinal region, with oozing of s
purulent matter; peritonitis, with sanguineous exudation; the re
surrounded by a pyogenic pseudo-membrane, extending all over
anterior surface of the pelvic vertebral column; the spleen distin
enlarged (about twice its normal size), its substance injected,
without marked naked-eye changes such as deposits or infarcts. M
scopic examination of the heart's blood, of the peritoneal exudation,
of the peri-rectal pyogenic membrane showed streptococci. The sp
tissue contained bacilli. Cultivations were made: (*a*) of the he
blood, (*b*) of the peritoneal exudation, and (*c*) of the spleen tissue,
the following results:—The cultivations of the heart's blood
crowded with colonies of streptococcus, as were also those from
peritoneal exudation and from the pyogenic membrane. These colo
of streptococcus were further examined in sub-cultures, and by inoc
tion into the ear of rabbits. In these animals typical erysipelas
thus produced. The heart's blood, therefore, along with the perito
exudation and the peri-rectal pyogenic membrane, contained
streptococcus of erysipelas in abundance.

Such being the case, it became necessary to refer to the poss
of the typhoid bacillus culture that had been injected into
monkey, and the following interesting facts were ascertained:—
gelatine culture used for the inoculation of these monkeys wa
first sub-culture (a "streak" on the surface of gelatine) from
mesenteric glands of a typhoid fever patient who had died of
foration of the bowel. I re-examined, therefore, the original cul
from this patient's mesenteric gland, and found that it contained, amon
a crowd of colonies of the typhoid bacillus, a limited number
colonies which on sub-culture proved to be the colonies of the strep
coccus of erysipelas. I next examined the companion gelatine s
culture of that actually used for the inoculation of these monkeys, findi
here also indications of streptococcus growth; and by plate-cultivatio
made therefrom this streptococcus was separated from the main mass
typhoid bacilli. The conclusion to be drawn is then this: that the
monkeys were inoculated not only with a large number of typhoid bacil
but also with a limited number of streptococci of erysipelas; this inde
seems to me the only feasible explanation of the erysipelas infection
monkey No. 2. And it will be remembered, from my 1892-93 repo
that in certain cases of perforation of the bowel during typhoid feve
there was positive evidence of the existence in the blood and in th
peritoneal exudation of the streptococcus of erysipelas. There appe
then in this monkey's case a parallel to last year's experience.

As to the spleen of monkey No. 2, this was, as has been said, fou
enlarged. Cultures made from it, by rubbing a small particle of t
spleen tissue over the slanting surface of gelatine, showed a crowd
colonies in pure state. These were examined by sub-cultures, and th
were found to be typhoid bacilli. Here again, therefore, this monkey
case was in a sense parallel to the human typhoid fever case of last yea
In that case, notwithstanding the presence of streptococcus in th
heart's blood, cultures from the spleen were practically pure cultures
the typhoid bacillus; and I inferred that while the latter finds in t
spleen a good nidus for growth, the streptococcus cannot live and gr
in that tissue.

It needs to be stated here that though these bacilli obtained from t
spleen of monkey No. 2 possessed in all morphological and cultu

respects the character of the typhoid bacillus as obtained from the human subject, a few gas bubbles nevertheless appeared in the first "shake" sub-cultures made from a spleen-tube. But on subsequent sub-cultures (shake sub-culture) no gas bubbles appeared.

The small intestine of this animal showed, on post-mortem examination, nothing abnormal.

As already mentioned, there was in this monkey No. 2 an open suppurating sore at the seat of inoculation. The animal had since the third day been constantly and violently scratching the place of inoculation, and the production of the sore was a necessary sequel.

The chief point of interest in this experiment is that the typhoid bacillus had been capable, on subcutaneous injection, of establishing itself and of multiplying within the monkey's spleen, and that simultaneously with this the animal became subject of a general and fatal infection with the streptococcus of erysipelas, accompanied by a localised peri-rectal suppuration.

The companion animal, monkey No. 1, was kept under observation for over four weeks. Its swelling in the inguinal region had disappeared by the eighth day, and throughout the period of observation it remained perfectly well; it was lively and fed well. Ultimately it was killed, and no abnormal condition was anywhere discoverable; the spleen looked normal, and on cultivation yielded no growth of any kind.

Experiment II.—Two Rhœsus monkeys, Nos. 3 and 4, were inoculated subcutaneously in their groins with the companion gelatine culture to that used in Experiment I.; that is to say with a culture which was composed chiefly of the typhoid bacillus, but contained also a limited number of streptococci. The after history of the animals is noted in detail in the accompanying table, and it will be seen therefrom that, as far as the body temperature is concerned, they did not show any marked change.

Date.	Temperature in Degrees Centigrade.		Remarks.
	Monkey No. 3.	Monkey No. 4.	
Day before inoculation -	39·6	38·8	
Day of inoculation -	39·	38·8	
1 day after inoculation	39·	40·2	No. 3 has slight diarrhœa; both eat well and are lively.
2 „ „ -	40·3	40·3	Both have diarrhœa, but eat well and are lively.
3 „ „ -	39·2	39·2	Both have diarrhœa, are quiet and off their food.
5 „ „ -	38·1	39·6	Diarrhœa better, are quiet.
6 „ „ -	39·	39·2	No. 3 looks pale, has slight diarrhœa. No. 4 is well and feeds well.
7 „ „ -	38·4	39·	No. 3 still quiet, but eats fairly. No. 4 all right.
8 „ „ -	38·6	39·1	No. 3 is quiet and getting thin. No. 4 all right.
9 „ „ -	38·4	39·1	No. 3 has again diarrhœa, is quiet and pale. No. 4 all right.
10 „ „	38·2	39·1	No. 3 looks ill. No. 4 all right.
14 „ „ -	36·6	40·	No. 3 looks very ill, no diarrhœa. No. 4 all right.
15 „ „ -	35·5	40·	No. 3 found dead this morning. No. 4 all right.

The slight irregular rise of temperature observed in one other of the animals is no guide whatever as to their health similar irregular rise was noticed in companion animals not s any experiment. Similarly, the looseness of bowels that is m to have been observed on some days, equally occurred to other a that were kept under precisely the same conditions as to locality a but which had not been the subjects of experiment. From my tions on monkeys during the Influenza inquiry I have come to clusion that, in monkeys, an occasional slight rise of body tempera occasional diarrhœa afford no reliable indication of indisposition. may be, and as a matter of fact there have been, both in the In inquiry as also in the present Typhoid inquiry, occasional rises temperature with or without occasional diarrhœa in otherwise healthy monkeys, as attested by their normal liveliness an undisturbed appetite.

Both monkeys, Nos. 3 and 4, had a slight swelling at the seat o lation noticeable a few days after the operation. In monkey No disappeared by the end of a week; in animal No. 4 it lel, ov repeated and violent scratching by the animal, to an open sor which a little purulent matter could be squeezed out.

Monkey No. 3 (*see* table) suffered from occasional diarrhœa, t five or six days after inoculation; it was also quiet off and on, a not feed well. This condition, without diarrhœa, increased by t of a week; the animal became thin, and by the twelfth to fou day loss of flesh became very pronounced. The animal was fou on the sixteenth day.

At the post-mortem examination the following was noticed. large intestine was deeply congested, its contents fluid faecal m the lymphatic glands at the mesenteric margin of the large intestin slightly more prominent than normal; the small intestine was sli injected in its mucous coat, and contained yellowish mucus, which t the microscope showed numerous leucocytes; the spleen was enlarged; the liver and lungs looked in every respect normal.

Cultivations were made: (*a*) of the heart's blood; (*b*) of the ly glands attached to the large intestine; (*c*) of the contents of the l intestine; and (*d*) of the contents of the small intestine. The r was: From the heart's blood, from the lymph glands, and the spleen no growth of any kind was obtained. From the m contents of the small, and particularly from the contents of the intestine, numerous colonies of bacillus coli were obtained; none o typhoid bacillus. The cause of death, therefore, cannot be stated any rate there is no evidence that the subcutaneous injection o typhoid bacillus had anything to do with the illness and death of monkey.

As to monkey No. 4, this showed no evidence of disease; the sore gradually healed, and the animal while under observation nearly a month remained perfectly normal in all respects.

Experiment III.—Two Rhœsus monkeys, Nos. 5 and 6, were in lated with a large dose of the bacillus of typhoid fever obtained fro spleen of monkey No. 2, half a gelatine culture tube being used for animal. The history of their progress is shown in the accompa table.

Date.	Temperature in Degrees Centigrade.		Remarks.
	Monkey No. 5.	Monkey No. 6.	
Day before inoculation -	39·8	39·	
Day of inoculation -	39·6	39·	
1 day after inoculation	40·	40·	No. 5 lively. No. 6 has swelling at seat of inoculation.
2 „ „ -	40·9	40·5	No. 5 lively. No. 6 has swelling at seat of inoculation.
3 „ „ -	40·2	40·5	No. 5 has slight swelling at inoculation. No. 6's swelling suppurating.
4 „ „ -	40·8	40·8	No. 5's swelling suppurating. No. 6 has an open ulcer formed.
5 „ „ -	40·5	40·9	No. 5 quiet, off its food. No. 6 quiet, off its food, diarrhœa.
7 „ „ -	39·9	39·6	No. 5 has an open sore, eats better. No. 6's diarrhœa better, feeds again.
8 „ „ -	39·2	39·4	No. 5 lively and eats well. No. 6 eats well and is lively.
9 „ „ -	39·8	39·1	No. 5 lively and eats well. No. 6 eats well and is lively.

The table bears out what has been said above as to the body temperature and occasional diarrhœa in monkeys. Monkey No. 5 was killed on the eleventh, and monkey No. 6 on the thirteenth day.

Post-mortem examination of No. 5: Extensive sore in inguinal region at site of inoculation, with much purulent matter. The spleen enlarged. All other viscera normal. Made cultivations: (*a*) of purulent matter at seat of inoculation, (*b*) of heart's blood, and (*c*) of spleen tissue. The heart's blood was found sterile. From the purulent matter at the seat of inoculation, colonies of staphylococcus albus and proteus vulgaris (very abundant) were obtained. From the spleen a few colonies (6) were obtained in one of three culture tubes, for the inoculation of which a considerable amount of spleen tissue had been used; the other two tubes remained free of growth. The colonies of the one successful culture proved to be a bacillus, which, tested by subculture, differed from or resembled the bacillus coli and of typhoid respectively in the following points: (1) in gelatine shake culture it formed, like bacillus coli, abundant gas bubbles; (2) in streak and plate culture it grew with the same rapidity as bacillus coli; (3) in morphological respects it closely resembled bacillus coli, inasmuch as it was a short oval rod, without tendency to form long threads, and was not possessed of conspicuous motility; at any rate, there were only few individuals that showed motility. In these three points then this bacillus closely resembled bacillus coli. But (4), in its inability to give the indol reaction in broth culture; and (5), in its very slight tendency to curdle milk—the milk, even after a week's exposure to 37° C. showed no distinct curdling, though it became rather thickish—it differed from the typical bacillus coli and presented characters which belong to the typhoid bacillus.

Post-mortem examination of monkey No. 6 showed all the viscera normal. Cultivations made of the heart's blood and spleen remained free of any growth.

I am unable to say what is the exact nature of the bacillus t isolated in a very limited number of colonies from the spleen of No. 5. On the whole it seems very probable that it is a v bacillus coli, since in most respects it resembled this micr certainly did not possess the characters of the bacillus that was the injection, *i.e.*, that derived from spleen of monkey No. 2; it the typical typhoid bacillus of the human subject.

Experiment IV.—Two Rhesus monkeys, Nos. 7 and 8, wer lated subcutaneously in their groins with large doses of typhoid (derived from the spleen of enteric fever) from a gelatin No. 8 was affected with diarrhœa at the time of inoculation, condition (diarrhœa) passed off and recurred several times du period the animal was under observation.

Date.	Temperature in Degrees Centigrade.		Remarks.
	Monkey No. 7.	Monkey No. 8.	
Day of inoculation -	38·6	39·4	No. 8 has diarrhœa since y
1 day after inoculation	38·8	40·	No. 7 has diarrhœa. diarrhœa better.
2 „ „ -	39·8	40·4	No. 7, diarrhœa better. diarrhœa.
3 „ „ -	37·7	39·8	No. 7, quite well. No. well.
4 „ „ -	38·4	39·	No. 7, quite well. No. well.
5 „ „ -	39·2	39·6	No. 7, quite well. No. diarrhœa.
6 „ „ -	39·	39·2	No. 7, quite well. No. 8, di ceased.
7 „ „ -	37·7	39·4	No. 7, quite well. No. 8, well.
8 „ „ -	39·	39·2	No. 7, quite well. No. 8, well.
9 „ „ -	39·1	39·4	No. 7, quite well. No. 8, well.
10 „ „ -	39·4	39·6	No. 7, quite well. No. 8, diarrhœa.
12 „ „ -	—	39·4	No. 7, killed. No. 8, slight dia
13 „ „ -	—	39·1	No. 8, slight diarrhœa.
14 „ „ -	—	39·	„ „
15 „ „ -	—	—	No. 8, killed.
16 „ „ -			

Monkey No. 7 was killed on the thirteenth, monkey No. 8 on th teenth day after inoculation. The post-mortem examination of revealed no change in the viscera. Cultivations were made fro heart's blood, the mesenteric glands, and the spleen, but all rem sterile.

Monkey No. 8 had diarrhœa at the time of death. The large intes contained offensively smelling fluid matter, and numerous mucus fl which consisted of leucocytes, and were literally crowded with ba coli. The mesenteric glands looked large, and when cut into were l juicy; the spleen was slightly enlarged. Cultivations were made from the intestinal mucus, (*b*) from the mesenteric glands, (*c*) fro heart's blood, and (*d*) from the spleen tissue. The cultivations o intestinal mucus yielded abundant colonies of bacillus coli; those

within the inguinal lymph glands of that animal, rise whether the tissues of the calf may not be especially suitable the growth and development of this bacillus. It was, therefo necessary to test the point on further calves.

Experiment VII.—Two additional calves, therefore, wer in the same way as in Experiment VI., and with identi These other calves were kept for 14 days, and were then k enlargement of their lymph glands in the inguinal region o hind side was distinct, but all the viscera appeared normal. (from the lymph glands yielded numerous colonies of one a organism; and this, on microscopic examination and in s proved to be the typical typhoid bacillus.

The next questions that present themselves for inve these:—(1.) Can the typhoid bacillus thrive and multiply in of the milch cow; and if so (2), is it at any time capable of of that animal's body by way of the milk gland and the milk have not had an opportunity of putting these propositions t experiment, but in 1894-95 I hope to do so.

In 1893–94 I have continued these researches, directing my a to ascertaining, *firstly*, the presence or absence of poisonous ces, *i.e.*, of intracellular poisons, in the bacillary bodies of typical pathogenic bacteria; *secondly*, whether such intracellula if it existed in a given instance, is capable of producing the commonly referred to the particular bacterium; and *thirdly*, injection into an animal body of the intracellular substance of pathogenic microbe is capable of preventing in this experiment subsequent specific infection in ordinary fashion by introducti same microbe.

As typical pathogenic bacteria I have chosen four microbes which produces, on subcutaneous injection, in minute do rodents, a different specific disease. These four are:—

(*a.*) The bacillus anthracis.
(*b.*) The bacillus of diphtheria.
(*c.*) The bacillus of fowl cholera; and
(*d.*) The bacillus of grouse disease.

In addition, I have experimented with:—

(*e.*) A bacillus producing septicæmia in the guinea-pig.

The characters of the specific diseases produced in guinea subcutaneous injection with the bacillus anthracis, with the diphtheriæ, and with the bacillus of grouse disease, as also in th by subcutaneous injection with the bacillus of fowl cholera, are known that it is not necessary to recapitulate them here. T (*e*) species that I used is a bacillus which acts virulently on taneous inoculation of small doses of its culture into the gui In this animal it produces acute septicæmia leading to death wit to six days. The blood of the experimental animal contains afte the bacillus very abundantly, and the spleen is congested and en This bacillus was isolated by Dr. Beaumont from a bronchial gla child that died of broncho-pneumonia. On culture this bacillus characters which place it amongst the microbes which form the group to which belong bacillus coli, the bacillus of typhoid, the b of grouse disease, &c. It is characterised by active motility in the state; it is short, cylindrical in shape; it does not liquefy ge though it grows thereon rapidly; it forms gas bubbles in gelatine culture; it forms indol in broth culture after five to eight days; *not* coagulate milk; and it forms a brownish-yellow, or yellowish growth on potato.

I. Bacillus anthracis.

In order to test, by intraperitoneal injection, the action of the plasmic substance of the anthrax bacilli *per se*, the method adop me last year had—with a view of avoiding at the same tim growth and multiplication of this organism within the body, th causing a true infection—to be set aside. Scraping off the su growth from the surface of agar, distributing it in sterile bouillon injecting a definite quantity into the peritoneal cavity of the guine would have defeated my object, since the introduction of even a number of living anthrax bacilli would have ensured their rapid plication in the tissues of the experimental animal, and would inev have caused in it virulent anthrax. For the purpose theref ascertaining whether or not the protoplasm of anthrax bacilli co poisonous substances similar to those contained by the microbes

with in last year's experiments,* it was necessary to inject, not living but *dead*, anthrax bacilli. And in these experiments there was a further difficulty that had to be duly taken into account. It consisted in the circumstance that in any growth of bacillus anthracis that has developed on the surface of agar after incubation for 24 hours at 37° C., spores are always present; indeed after 48 hours' incubation such spores are often very numerous. Consequently the exposure (as in last year's experiments) of such a growth to a temperature of 70° C. for 10 minutes, though it would suffice to kill all the non-sporing microbes, would fail to kill any spores that happened to be present. Anthrax spores are not to be killed by exposure to 70° C. for 10 minutes; wherefore injection of an anthrax culture so treated into the peritoneal cavity or into the subcutaneous tissue of a guinea-pig, would inevitably be followed by germination into bacilli, within the animal, of spores that had escaped destruction, and the bacilli thus arising would by their multiplication and in their life processes produce a true infection, and forthwith kill the animal by anthrax. This I will illustrate by a case in point.

One third of an anthrax culture on agar was, after incubation at 37° C. for 24 hours, scraped from the surface of the medium, distributed in sterile bouillon, exposed to 70° C. for 10 minutes, and injected into the peritoneum of a guinea-pig. The animal was found dead the next day. The peritoneal fluid and the blood were full of living bacilli anthracis; and the spleen was typically enlarged and crowded with these bacilli. Since all the anthrax bacilli in the material injected had been killed by exposure to 70° C. for 10 minutes (anthrax bacilli are completely killed by exposure to 65° C. for 5 minutes), it follows that the above result must have been produced by spores of the bacilli, which, as is well known, are not affected by such temperature. As a matter of fact sub-cultures made from the above bouillon mixture after heating to 70° C. for 10 minutes, afforded colonies of anthrax bacilli.

It became therefore necessary to sterilise my anthrax cultures at much higher temperatures than 70° C. in order to kill the spores as well as the bacilli. This was effected by exposing the bouillon mixture (obtained as before, except that the agar culture of anthrax had been incubated at 37° C. for 48 hours) to 99·6° C. for 5 minutes. On testing, by sub-culture, the bouillon mixture after it had been thus dealt with, it was found to be barren of life; no anthrax colonies could be obtained.

Experiment I.—Accordingly of this bouillon mixture a definite quantity amounting to two-thirds of the scrapings from a single agar culture (the growth covered an agar surface of 6 centimetres by two centimetres), was injected into the peritoneal cavity of each of two guinea-pigs, Nos. 1 and 2. The animals appeared quite well the next day and on following days, and they continued thereafter in good health.

Experiment II.—The experiment was repeated on two further guinea-pigs, Nos. 3 and 4, using for the purpose agar cultures (as before 48 hours old) treated in the above manner. Each animal received two-thirds of the scrapings from a culture tube. The result was the same as in the first experiment, viz., the animals remained well.

Experiment III.—Two additional guinea-pigs, Nos. 5 and 6, were injected intraperitoneally with precisely the same kind of sterilised bouillon mixture of anthrax culture as in the preceding experiments,

* Koch's cholera vibrio, the vibrio of Finkler, bacillus coli, proteus vulgaris, the bacillus of typhoid, staphylococcus aureus, and bacillus prodigiosus.

each animal receiving between one half and two-thirds of a culture. The result was that they both appeared rather quiet the next day they were again lively the following day and remained well.

From these experiments it would appear that bacillus anthracis classical pathogenic microbe, differs entirely as regards the nature intracellular substance from microbes like proteus vulgaris, bacillus digiosus, and bacillus coli. Considerably less than two thirds scrapings from a culture tube of either of these, or of Koch's c vibrio, or of the vibrio of Finkler, suffice, as has been shown in year's report, when injected peritoneally, to produce in guinea-pigs peritonitis and generally death of the animal. But it is not so wi bacillus anthracis. In the first two experiments guinea-pigs Nos. 1 and as regards Nos. 3 and 4 also, absolutely no result at all was ob by intraperitoneal injection of what in the case of bacillus prodigio bacillus coli would be more than a fatal dose. If it be urged that inas as in last year's experiments, the cultures used (Koch's vibrio, vib Finkler, bacillus coli, bacillus prodigiosus, bacillus typhosus, and p vulgaris) were sterilised at 70°, whereas those of the bacillus anth now in question, were sterilised at the considerably higher tempe 99·6° C., the answer is that sterilisation of the first set of microb 99·6° C. does not in any way modify their activity*; the actio the guinea-pig of the intracellular poisons of bacillus prodigi bacillus coli, and of the other microbes remains the same whether exposed to a temperature of 70° or of 99·6° C. So that it may be s inferred that the intracellular substance of the anthrax bacilli quite a different character from the intracellular substance of the a microbes. Anthrax bacilli *per se* are barren of poisonous action, other bacilli referred to possess on the contrary poisonous character.

The above guinea-pigs Nos. 1, 2, 3, 4, 5, and 6 were next tested to any resistance against anthrax infection acquired by them as the re of these intraperitoneal injections with large doses of the intracellu substance of anthrax bacilli. Thus:—

After the lapse of about a week they, as well as a control guine pig, were injected *subcutaneously* in the groin with a small dose living anthrax culture. The result was the production in all of the of typical virulent anthrax. It need hardly be said that this result not surprise me seeing that the first injection with the intracellu substances had not produced any definite result; for in last year's repor was shown that an immunity, or rather a tolerance, against a second inj tion was produced in the experimental animal by a primary injection non-fatal doses (of the same or another microbe of the series) on when by such primary injection distinct illness had been establishe But in the case of the bacillus anthracis no illness was produced by t injection of a large dose of the intracellular substance; wherefore tolerance against a second fatal dose, *i.e.*, of living microbes, was to expected. There can be no question therefore that anthrax bac differ from the microbes worked with last year in the circumstance th their intracellular substance is harmless as compared with that of t others.

But not only do guinea-pigs fail to acquire by a previous intrape toneal injection of the intracellular substance of bacilli of anthrax a resistance against a general infection with anthrax if the latter subcutaneously injected, but they also fail to acquire by the fi

* Pfeiffer has already shown that boiling does not alter the action of the chol vibrio.

intraperitoneal injection any resistance against a subsequent infection with anthrax viâ the peritoneum. This is shown by the following experiment.

Experiment IV.—Two guinea-pigs, Nos. 7 and 8, each received per peritoneum a large dose of sterilised anthrax, *i.e.*, one-third of the scrapings from an agar tube which had been incubated 48 hours. Both animals were perfectly normal the day after the injection. These two guinea-pigs, as well as two fresh guinea-pigs, Nos. 9 and 10, were then two days later injected *intraperitoneally* with sterilised anthrax, each animal receiving half of the scrapings from an agar culture, incubated for 48 hours. All four animals were found perfectly well the day after injection, and they remained so. At the end of a week these four guinea-pigs, as also one control guinea-pig, were injected again intraperitoneally, with small doses of the spores of anthrax. All five animals were found dead of typical anthrax within 48 hours.

II. Bacillus Diphtheriæ.

Experiment I.—From one gelatine and from two agar cultures, over the whole slanting surfaces of which the bacillus diphtheriæ had produced copious growth, the colonies were scraped off, were mixed with sterile salt solution, and this mixture then exposed to 70° C. for 10 minutes in order to sterilise it completely. Next, two guinea-pigs, Nos. 1 and 2, were intraperitoneally injected therewith, each animal receiving what corresponded to the growth from one whole culture tube. On the day following their injection both animals were found quiet and a little off their food; but the next day they were again lively and fed well. They remained well during subsequent days.

Experiment II.—Two guinea-pigs, Nos. 3 and 4, received, per peritoneum as in Experiment I., each two-thirds of the sterilised scrapings from an agar culture of diphtheria bacillus. The next day both animals were quiet and off their food, but on the following day they had quite recovered.

Experiment III.—Two guinea-pigs, Nos. 5 and 6, were injected intraperitoneally as before with sterilised scrapings from an agar culture of diphtheria bacillus, each animal receiving the growth from one whole culture tube. On the following day they were quiet, but on the third day the animals were found perfectly well, and they remained so.

In this diphtheria series then there is observed the same curious result as which was obtained with the bacillus anthracis series. The pathogenic bacillus diphtheriæ, in so far as its intracellular substance is concerned, is barren of the poisonous effect which characterised the protoplasm of bacillus coli, of vibrio of Finkler, of bacillus prodigiosus, and others.

All six guinea-pigs of the above diphtheria series were, after the lapse of 10 to 12 days subjected, along with a normal control guinea-pig, to *subcutaneous* injection with living broth culture of the bacillus diphtheriæ. The result was in all cases the same, viz., great swelling, after 24 hours, at the seat of inoculation, and death in between 36–60 hours. In this respect, therefore, my diphtheria experiments and my anthrax experiments are completely parallel; in neither case by primary intraperitoneal introduction of large quantities of intracellular substance was there resistance conferred against a subsequent subcutaneous injection with the living bacilli.

Experiment IV.—Two guinea-pigs, Nos. 7 and 8, were i
intraperitoneally with *living* (non-sterilised) diphtheria bacillu
animal receiving about one fourth of the scrapings from the surfa
gelatine culture. Both animals were quiet in the afternoon of th
day, but both seemed all right the day after. Towards the end
week (sixth day) they again became quiet, left off feeding, an
were found dead on the eighth day. In the peritoneal cavity
was found a small amount of turbid sanguineous exudation. T
tested by cultivation; but though numerous colonies of proteus v
came up, no diphtheria bacilli could be recovered. So that fro
experiment it would appear that on injecting large doses of living
of diphtheria bacillus into the peritoneum of guinea-pigs there d
occur that local multiplication of the bacilli which is observed af
cutaneous injection of the microbe. This experiment was und
as a preliminary to other experiments which were to be dire
ascertaining whether a guinea-pig that has been injected intraperi
with the intracellular substances of this bacillus has thereby a
resistance against subsequent intraperitoneal injection of the
bacillus; for of course it was first of all necessary to ascertain the r
intraperitoneal injection into the guinea-pig of the *living* bacill
experimental infection of guinea-pigs with diphtheria has hither
commonly induced in the laboratory by subcutaneous injection,
result of the above experiment was then not satisfactory, inasm
injection per peritoneum of living diphtheria bacilli did not act
same acute manner as the subcutaneous injection of this org
Nevertheless:—

Experiment V.—Two guinea-pigs, Nos. 9 and 10, were i
intraperitoneally with *sterilised* diphtheria scrapings from an
culture, each animal receiving the scrapings of about one-h
culture tube. They remained well. Five days after they, as
as a control guinea-pig, were injected, also *intraperitoneally*,
a syringe full of broth culture of *living* diphtheria bacilli. Guine
Nos. 9 and 10 remained perfectly well, but the *control animal*
dead in 48 hours. Now since the control animal died, whereas the o
two guinea-pigs remained well, it might seem that the first in
peritoneal injection had conferred on these latter resistance ag
diphtheria infection. But the death of the control animal does
necessarily support such inference, for the reason that the broth cu
used contained chemical metabolic substances, which by themse
and apart from the bacilli (as was shown by Roux and Yer
researches), act poisonously on the guinea-pig. Indeed, a whole Pr
syringe full of such a culture is sufficient, independent of the conta
bacilli, to kill several guinea-pigs, and the death therefore of the co
guinea-pig may be thus accounted for. And in this connexion
significant that from the viscid peritoneal exudation of this co
guinea-pig no cultures of diphtheria bacilli could be obtained.
survival of the two guinea-pigs Nos. 9 and 10 may therefore indi
not so much resistance to subsequent living infection, as resista
against the metabolic products of the bacilli when these are introdu
intraperitoneally. The question as to any real protection requ
by guinea-pigs Nos. 9 and 10 was therefore further tested.

Experiment VI.—The above two guinea-pigs, Nos. 9 and 10, were
injected *subcutaneously*, each with large dose (quarter of a culture
living bacilli that had been scraped from the surface of a gelatine
At the same time one control guinea-pig, (*a.*), was injected *intrap*
toneally, while a second control guinea-pig, (*b.*), was *subcutaneo*
inoculated, each with a like amount of the same culture.

The result was interesting. Control guinea-pigs (*a.*) and (*b.*), and guinea-pig No. 9 were found dead within 40 hours; while guinea-pig No. 10 died in 50 hours. Moreover control guinea-pig (*b.*) and guinea-pigs Nos. 9 and 10 had each of them the usual hæmorrhagic swelling at the seat of inoculation; so that by this experiment it is demonstrated that guinea-pigs Nos. 9 and 10 were not possessed of resistance against the infection of diphtheria administered to them in ordinary fashion.

III. Bacillus of Fowl Cholera.

Experiment I.—Cultures were established on the surface of agar with the blood of a rabbit that had died after inoculation with material from typical fowl cholera. The growth which appeared in the agar tubes was scraped off and distributed in broth, and a droplet of this mixture, containing the microbe in living condition, was injected into the subcutaneous tissue of a (control) rabbit. The rest of this mixture was then sterilised by heating it at 70° C. for 10 minutes, after which two rabbits, Nos. 1 and 2, were injected intraperitoneally therewith, each rabbit receiving what amounted to the scrapings of one whole culture tube. Next day rabbits Nos. 1 and 2 were found quite well, and they remained so; the control rabbit, on the other hand, was found dead from typical fowl cholera.

Experiment II.—The like experiment was repeated on two further rabbits, Nos. 3 and 4, each animal receiving per peritoneum the sterilised bacilli scraped from two agar cultures. The result was that both animals were found lively and well the next day, and they remained so.

All four rabbits were then, six days later, tested by inoculating two (No. 1 and No. 3) ***subcutaneously***, and other two (Nos. 2 and 4) ***intraperitoneally*** with a small quantity of living bacillus of fowl cholera scraped from the surface of agar culture. As a result, all four rabbits were found dead the next day of typical fowl cholera.

Experiment III.—Three rabbits, Nos. 5, 6, and 7, were injected intraperitoneally with sterilised culture of bacillus of fowl cholera, each animal receiving two-thirds of the scrapings from an agar tube. They remained perfectly well. After five days all three animals and one control animal (No. 8) were injected ***intraperitoneally*** with living culture of this bacillus. All four animals were found dead of typical fowl cholera within 48 hours.

Here then is illustrated in a still more striking manner the same experience as before. The highly virulent and specifically pathogenic bacilli of fowl cholera do not possess in their intracellular substance any poisonous material. Large doses thereof—as much as the whole scrapings from a culture tube—introduced per peritoneum have no effect whatever on rabbits; such injection is incapable of preventing in these animals subsequent typical infection, whether by subcutaneous or by intraperitoneal administration.

IV. Bacillus of Septicæmia of the Guinea-pig.

The growth having been scraped off the surface of agar cultures of this bacillus, and distributed in sterile bouillon, a few drops of the mixture were, as a preliminary experiment, injected, ***subcutaneously*** into one, and ***intraperitoneally*** into a second, guinea-pig. The latter was found dead the next day, the former on the third day. In both cases the spleen was enlarged, and the blood full of the microbes. As

soon as the above control guinea-pigs had been injected, the bo
mixture was sterilised by exposure to 70° C. for 10 minutes, an
used for injection into the *peritoneal* cavity of two guinea-pigs,
and 2. The quantity used for each animal amounted to the scrapi
half of a culture tube. The result was *nil*, both animals remaine
Next, both these guinea-pigs, as well as a control guinea-pig, were
sixth day subjected to *subcutaneous* injection with a few drop
living culture of the septicæmia bacillus. Guinea-pig No. 1 died
third day, at which date guinea-pig No. 2 was ill, and had a big sw
at the seat of inoculation. This animal became daily weaker and w
and ultimately died on the eighth day. The control guinea-pig,
had a big swelling at the seat of inoculation, died on the fifth day.

In the case then of the bacillus of septicæmia of the guinea-pig, t
also demonstration of absence of poisonous property in the intra
substance of the bacilli.

V. The Bacillus of Grouse Disease.

This organism has been shown by me* to be pathogenic
guinea-pig. It is capable of producing in that animal, on subcut
injection of moderate doses, acute disease and death, with multipli
of the bacilli in the blood. Only about 50 per cent., however,
animals thus injected in moderate dose actually succumb; the rest
only a swelling at the seat of inoculation, which, having grad
enlarged, becomes firm, then smaller, and disappears altogether
to 14 days from the date of injection. Small doses (two to three
of recent broth culture) as a rule produce death in a small mi
only of the animals. So that, so far as the guinea-pig is conc
(mice are much more susceptible), this bacillus is not as regard
pathogenic action to be compared with the bacillus anthracis. W
however, guinea-pigs are injected in their *peritoneal cavities* wi
trace (one loop) of the living growth taken from the *surface* o
agar culture 48 hours old, they die within 20 hours *from acute in*
sive peritonitis, the exudation and the heart's blood being crowded w
the bacilli.

In order to see how intraperitoneal injection of the sterilised in
cellular substance of these bacilli affects the guinea-pig, the follo
experiments were made.

Experiment 1.—Agar cultures of the grouse bacillus were incub
for 48 hours at 37° C., by which time the surface of the agar was cov
with a thick layer of colonies of the micro-organism. This growth
scraped off and distributed in sterile bouillon, and the mixture it
sterilised by exposing it for 5 minutes to 75° C. One guinea-pig, N
received then per peritoneum what amounted to two-thirds, anot
No. 2, one third of the growth from one culture tube. On the day
lowing the experiment both animals were found quiet and off their f
In the morning of the third day, *i.e.*, before 48 hours had elapsed, N
was found dead, No. 2 still remaining at this date quiet and off its fo
The post-mortem examination of guinea-pig No. 1 showed copi
hæmorrhagic exudation into the peritoneal cavity, with lymph
pseudo-membranes on the omentum and the liver; that is to say, th
had been produced in this guinea-pig the same acute intensive perito
which was produced in other animals last year by intraperitoneal in
tion of large doses of the sterilised protoplasm of bacillus coli, of bac

* Grouse Disease, Fowl Enteritis, &c. Macmillan, 1892.

prodigiosus, and of other bacteria. And, as was to be anticipated from my former experience, the peritoneal exudation of this guinea-pig No. 1 contained no living bacilli: cultures made from it remained sterile. Guinea-pig No. 2 recovered; it was quite well on the sixth day.

Experiment II.—Two guinea-pigs, Nos. 3 and 4, were similarly injected intraperitoneally with sterilised agar culture of the bacillus, each animal receiving about two-fifths of the scrapings from a culture tube. Both animals were quiet and off their food the day following the experiment, but on the third day they were seemingly all right again.

Experiment III.—Two guinea-pigs, Nos. 5 and 6, were injected intraperitoneally with the sterilised bacilli, each animal receiving about two-thirds of the scrapings from an agar culture. One was found dead the next morning, and the other, which looked very ill, died on the fourth day. The post-mortem appearances in both cases were the same as in guinea-pig No. 1 of this series.

From these experiments it appears that two-thirds of the sterilised scrapings from a culture of the grouse bacillus administered intraperitoneally to guinea-pigs acts fatally, and that the same material injected in smaller amount produces only a transitory illness, from which the animals recover. This indicates that the grouse bacillus, so far as its intracellular substance is concerned, comports itself more in the manner of bacillus coli and bacillus prodigiosus; which indeed was to be anticipated from the fact already recorded, namely, that it possesses only a limited specific pathogenic action on the guinea-pig.

The other three guinea-pigs, No. 2, No. 3, and No. 4, that had recovered were next subjected to test as to whether they had, as a result of their intraperitoneal injection, acquired any power of resistance against a *subcutaneous* injection of living culture of the grouse bacillus. These guinea-pigs, and as well a control guinea-pig, were injected *subcutaneously* with recent broth culture, each receiving the same quantity, about five divisions of a Pravaz syringe. All four animals were found quiet and off their food the next day; especially the control guinea-pig, which was very ill, and on attempting to move shook a very great deal. This control animal was found dead in the morning of the third day, but the other three, though still quiet, had by this time recommenced feeding, and they were seemingly quite well again by the fourth or fifth day.

Experiment IV.—I now sought to ascertain whether a first intraperitoneal injection of the (sterilised) intracellular substance of the grouse bacillus protects against a second *intraperitoneal* injection of the living bacillus. Two guinea-pigs, Nos. 7 and 8, were therefore injected intraperitoneally with sterilised bacilli, each animal receiving one-third of the scrapings of an agar culture. The day following they were quite well. Five days later these two animals, and two additional guinea-pigs, Nos. 9 and 10, were injected intraperitoneally with similar sterilised culture, each animal receiving a quarter of the scraping from an agar culture. On the following day all four animals were found well. After lapse of further five days, thes four animals were again injected intraperitonally, this time with *living* culture, each animal receiving as before a quarter of the scrapings from an agar tube, while at the same time two control guinea-pigs received intraperitoneally each one-twelfth of the scrapings from a similar culture. The two control guinea-pigs were found dead within 48 hours; but the other four guinea-pigs were lively and well, and they remained so.

Upon the whole, then, the bacillus of grouse disease behaves more like bacillus coli and bacillus prodigiosus than like the anthrax bacillus

or the bacillus of fowl cholera:—an intraperitoneal inje definite amount of intracellular material, furnishes the exp animal with resistance alike against a dose which, whether adm subcutaneously or intraperitoneally, would in a control animal prove fatal.

I next sought to ascertain in regard of each of the a microbes: (1) Whether *subcutaneous* injection of their protoplasm into rodents caused in these animals any illness; whether such procedure afforded them protection against su *subcutaneous* injection of the living bacillus.

Subcutaneously injected no action of any kind is produced doses of the intracellular substances (sterilised bacilli) of a foregoing microbes; the experimental animals remain perfectly w on the other hand, no resistance is thus produced against in living bacilli; all animals prepared in the above manner exactly like the control animals, to a further subcutaneous inje the living bacilli.

Summarizing the results of these experiments, two facts, stand out very conspicuously.

(1.) Unlike Koch's cholera vibrio, Finkler's vibrio, bacillus typhoid bacillus, the bacillus prodigiosus, and the proteus injection into the peritoneal cavity of guinea-pigs of large dose intracellular substances of bacillus anthracis, of bacillus diphthe of bacillus of fowl cholera respectively, does not exert poisonous

(2.) A previous administration per peritoneum of large dose intracellular substances of bacillus anthracis, of bacillus dip and of bacillus of fowl cholera respectively does not confer on gui any immunity whatever against, or even tolerance of, a further i with the living microbes.

(3.) The bacillus of grouse disease differs from the othe microbes that have this year been subjected to experiment, in th Koch's cholera vibrio, Frinkler's vibrio, bacillus coli, bacillus prodi and proteus vulgaris, a previous administration per peritoneum of dose of its intracellular substance does confer on the guinea-pig tole of further injection, whether subcutaneous or intraperitoneal, living bacillus.

No. 3.

Report on Psorosperms in their Relation to the Etiology of Cancer; by Dr. Klein, F.R.S.

One of the most fully studied of the animal diseases that are caused by psorosperms or sporozoa, is a well-known chronic nodular disease of the liver and of the alimentary canal of the rabbit. The researches of Leukart, Virchow, Malassez, and others, have given us a comprehensive account of the nature of the parasite (coccidium oviforme of Leukart) concerned; of its life history within and outside the animal, and of the hypertrophic changes it causes in the epithelium of the intestine and of the liver.

This parasite, it appears, lives and thrives within and at the expense of the epithelium, at the same time causing the epithelium to rapidly proliferate. In consequence of its attacking the bile ducts of the liver, it causes a great hypertrophy of their epithelium; the bile duct becomes greatly distended, its wall thickened and folded; and, as a result, numbers of white nodules, at first small, then gradually increasing in size, appear throughout the liver. These distensions become converted into more or less irregular cysts, and from their walls of thickened membrane a number of larger and smaller folds covered with hypertrophied epithelium project into their interiors, which are in effect sections of the original cavity of the bile duct. Between and within the cells of this hypertrophied epithelium sporozoa, the coccidium oviforme, are found growing and multiplying. As the process advances, larger and larger zones of the adjoining liver tissue atrophy, and ultimately the animal succumbs. The presence of the coccidium oviforme in the liver of the rabbit is solely responsible for this distinct hypertrophy of the epithelium of the bile ducts.

Another disease in which the presence of psorosperms, or at any rate of parasites morphologically related to them, causes a chronic thickening and hypertrophy of epithelial structures, has been described by L. Pfeiffer (die Protozoen als Krankheitserreger) as occurring in the fowl. This animal is occasionally found to show on its skin in various parts of the body, large and small prominent nodules which consist of greatly hypertrophied epidermis (stratum Malpighii) with corresponding infiltration of leucocytes and distension of the blood vessels of the subjacent corium. The disease in question—epithelioma contagiosum of the fowl—is not at all of rare occurrence, and when it occurs on a farm it generally spreads to other fowls. I have myself met with several such instances. Sections made through the nodules show an enormous local

hypertrophy of the stratum Malpighii of the epidermis; and amo
epithelial cells, in many places within these cells, are found ova
mostly capsulated, which are distinctly of the nature of psoro
On staining the sections in fuchsin, and then washing in a
dilute nitric acid, the epithelium is decolourised and leaves the
sperms stained pink; in this manner the psorosperms, with the
protoplasm, their capsule and clear nucleus, can be easily recogn
is not a question of finding such a psorospermic corpuscle h
there; the epithelium is pervaded by them in almost continuous
They are found isolated within the epithelial cells, destroy
substance of these latter; or, when the epithelial cells are
destroyed over extensive areas, the psorosperms are found
entirely replaced them. There is not the slightest difficulty i
nising these psorosperms and in differentiating them from the e
cells. This disease in the fowl is, like the psorospermosis of the
the rabbit, essentially a chronic hypertrophy of the epithelium c
the process of growth and multiplication of the psorosperm para

Now, there are recognised in the human subject a number of
diseases which consist essentially in a chronic hypertrophy, w
mate destruction, of the epithelium of the skin, and of various
membranes. The principal of such diseases are known as: L
disease, molluscum contagiosum, Paget's disease of the nipple
breast, and last, but not least, various forms of epithelioma and ca
the skin, mucous membranes, &c. The number of observers wh
searched for and found in these various chronic epithelial di
parasite-like bodies comparable to psorosperms is legion; be
equalled, if not surpassed, by the number of other observers
though they have searched for these alleged psorosperms in
diseases with equal care and perseverance, have utterly failed to i
them.* While, however, it is one of the simplest and easiest
to demonstrate, by a microscopic examination of the above-men
nodular disease of the rabbit, not only the existence of the psoros
but their relation also to the hypertrophy of the epithelium, it is
another affair to obtain anything like clear evidence of si
conditions in the above-named human diseases. In the first p
amongst the number of observers who affirm that they have disco
psorosperms in epithelioma of the human subject, there are sc
two who describe the same parasite; while not one amongst th
able to do more than draw attention to certain morphological appear
in the epithelium which are put forward as denoting the presen
something extraneous to the typical epithelial cells. No one has in r
of cancer ever succeeded in isolating the parasite, as is easily enough
in the psorospermosis of the rabbit; and, all assertions to the cont
the evidence amounts only, as I have said, to description of certain
which, after certain methods of staining, can be demonstrated with
between the epithelial cells in the above human affections. Am
these bodies, however, none are typical psorosperms. Under
circumstances the critics of those who affirm a parasite cause of c
have an easy task; they can with perfect justification demand, wh
if such-and-such indefinite and mysterious bodies do occur in canc
epithelium—is the proof that they are of a parasitic nature. To th
others can only reply that they are most probably parasites, because
are not typical epithelial cells. But how do you know that they a

* An excellent summary of all these researches is given by Strœbe
"Centralblatt für Allg Pathol," &c., 1894, nos. 1, 2, and 3.

occupied by a vacuole, while within this vacuole lie three rou
cells, each with several nuclei. Most histologists recognise these
as vacuolated epithelial cells containing common leucocyte, such as
are commonly found in epithelium under pathological conditio
normally in certain localities, *e.g.*, fauces, tonsils, and tongue.
vacuolated epithelial cells containing leucocytes have been fa
histologists for many years; they were the very cells about
17 or 18 years ago, a considerable amount of discussion aro
question then under debate was: whether they are endogenously d
within the inflamed epithelium (Stricker, Rindfleisch, and oth
whether, as Cohnheim and others maintained, and as is now ur
believed, they are immigrants into the epithelium and into the
cells themselves. As matter of fact, they are found easily
epithelium in gonorrhœa and in the conjunctiva in
(blenorrhœal) inflammation.

Messrs. Ruffer and Walker meeting, in cancer, with va
epithelial cells enclosing several leucocytes, seem to assume th
has originally been a parasite within each such epithelial cell, w
been eaten up by the leucocytes ! ! ! And in this way it could
that, in a considerable number of instances, belief has arisen
existence of coccidia, psorosperms, and other parasitic forms i
epithelial cells. Those enunciating such belief would seem
wanting in a clear understanding of the elements of the proble
which they are concerned; for in dealing with purely morph
questions, such as the presence or absence of certain bodies in th
trophied epithelium constituting cancer and similar chronic
diseases, it is obvious that a critical apprehension of what ap
to cancerous epithelial new-growths *and to no other epithel
health or disease*, is necessary as an elementary condition for
study of the subject. And let me here at once say, in maki
statement, that I am in no way disinclined to regard molluscu
tagiosum, Paget's disease, and cancer as belonging to the gr
infectious diseases that are of parasitic origin; all that I *wish to insis*
that many, if not most of the assertions as to the actual demonstrat
the presence of coccidia, psorosperms, and similar parasites in cance
in allied diseases, are not founded on anything like admissible evid

I now proceed to analyse in detail certain histological facts re
by various observers, and to add thereto the observations which I
have made in regard to epithelial cancer.

A careful examination of suitably prepared sections through epi
structures, such as the epidermis of the skin, the mucous membr
the mouth, fauces, and pharynx, and of glands (salivary glan
pancreas), after hardening in Fleming's solution and staining in
and methyl blue, or in rubin and methyl blue, reveals the fact tha
are epithelial cells among which there occur, here and there, cells
deviate from the normal and typical appearance. These dev
epithelial cells do not contain the single characteristic nucleus wi
more or less spongy or filamentous intranuclear network including
or small chromatin granules-nucleoli; but instead they contain a sl
transparent nucleus, and also a circular or oval, generally well-d
homogeneous body slightly smaller than the typical nucleus. The
lie close together, but they stain differently; in sections stained
rubin and methyl blue the nucleus is blue, while the other body is
and they differ in the same way where the sections are stai
fuchsin and methyl blue. This other body corresponds, most pr

to what was first observed by Balbiani in ovum cells as a paranucleus, and was observed also by Grützner in the gland cells of the pancreas; and it requires only a careful study of other epithelial structures to find in them here and there (sometimes very sparsely, at other times in greater amount) cells which, besides a principal nucleus, contain something which corresponds to a paranucleus. That this paranucleus is really derived from the principal nucleus, notwithstanding the different manner in which it stains, is evinced by the following facts:—(*a*) its juxtaposition and close relation to the former; and (*b*) the circumstance that the principal nucleus is in these cases always more transparent and contains less of the chromatic substance than is contained in those cells which are free of a paranucleus.

Another point which is important to mention in this connexion is that, the more distinct evidence there is of growth and reproduction going on in the epithelium, as shown by the presence of karyomitotic figures, the more likely are cells to be met with which contain such a paranucleus. I have examined, in this direction, sections through the skin and mucous membrane (palate and tongue) in inflammation, after the acute inflammatory process has subsided, and have found among epithelial cells, and also among the connective tissue cells in the superficial corium, swollen cells in which, besides the principal nucleus, there was present the above-named paranucleus. I possess sections through the skin of inoculated sheep-pox in the stage of vesiculation, wherein the marginal portion of the pock outside the vesicle is covered with thickened epithelium, and in which every epithelial cell of the stratum Malpighii, and every connective tissue cell in the marginal part of the tissue, shows a principal nucleus and a paranucleus—the former stained blue, the latter pink. These appearances are uniform and very striking. In these cases it is generally noticed that the principal nucleus appears hydropic, *i.e.*, clearer and containing less chromatin than normal, and that by its distinct membrane being stained blue (methyl blue) it is in marked contrast with the paranucleus, which is less sharply outlined and is stained pink (rubin); in some cells this pink body contains one or more granules. This is an extreme case, but, as I have already mentioned, similar cells with paranucleus stained differently from the principal nucleus are to be met with in other conditions, both in health and particularly in inflammation. But it might be nevertheless argued that in the above case of sheep-pox, this second intracellular (pink) body is possibly a parasite, as it corresponds to some of those figures represented by particular observers in the epithelial cells of cancer as spores of psorosperms. To this I can only answer that, if so, it is very remarkable to find every epithelial cell and every connective tissue cell of the peripheral part of the pock containing one and the same kind of additional body. One could, indeed, accept *a priori* the parasitic nature of this secondary body if it occurred exceptionally only in epithelial cells: but it is out of question to accept this view when one finds it in every epithelial cell and in every connective tissue cell. And further, be it observed, it is everywhere of exactly the same kind, and the cell substance in every instance is of a uniform normal character. In addition, it completely resembles the body found in some epithelial cells under conditions already noted, wherein the presence of a parasite is seemingly quite out of the question.

Hence, it appears that occasionally, in epithelial and in other cells, there occurs, besides the principal nucleus, and more or less close to it another body which, though it stains differently from the nucleus, is in many

ways to be regarded as its derivative. For this reason I retain the name of parasomes. This then is the first obstacle to scr of many of the assertions as to the presence of an intracellular like parasite in cancer cells; namely, no amount whatever is this parasomes.

A second obstacle is this: Examination of the epithelium in a of states, particularly under pathological conditions, shows which small, generally round, particles of the cell substance are s from the main body. This separation is accentuated by the of a clear zone around each such particle, as if by the formati vacuole around it. As a matter of fact, such appearances are m more numerously where there is not only rapid new formation o epithelial cells, but at the same time a retrograde change other and older cells, as is evinced by the dropsical condition nuclei and the loosening and separation of such cells from their bours. The particles thus separated either take the stain as the the cell substances, or they take it in a different tint; but betwe two states all gradations can be made out. This separation of p of the cell substances by clear vacuoles, is sometimes so extens a large part of the cell substance seems broken up into such particles, small and large, almost every one of which is encl its separate vacuole. These appearances are of particular i in reference to the statements repeatedly made as to the presen small spores of sporozoa, singly and in groups, within the substa the cancer epithelial cells (Sjöbring, Soudakewitsch). But the also epithelial cells, in which the main part of the cell substance i whole separated from the marginal part by a clear zone; it then as if a spherical protoplasmic mass, including the nucleus, were en in a capsule. This by some writers on cancer parasites is descril an encysted nucleated sporozoon. But as stated just now, this appea is to be met with in a variety of pathological conditions of epith structures. Such condition of affairs, viz.: separation *by a clear* of the main central part of the substance of the *epithelial cell (inclu* the nucleus) from the marginal layer, simulating a capsule, is notice in the stratum Malpighii in chronic inflammation of the skin, in regeneration of the epidermis, and in other stratified epithelium u normal and abnormal states. Whether or not this condition stan definite relation to the normal structure of some cells recently desc by F. Heidenhain, it is not possible to say; Heidenhain's observat however, as to the normal differentiation of the cell protoplasm into n is very suggestive as offering an explanation of the above change.

As regards the separation from, or rather enclosure within, the substance of small and large particles (with or without vacuole clear space, surrounding them), and which particles may or may stain in the same way as the main body of the cell, it is difficult to whether these particles are merely parts of the original cell substance n or less chemically modified, or are deposits in the cell body, *i.e.*, prod of chemical changes in the cell body. At any rate two things *can* asserted with confidence: (1) that these particles are to be met i variety of conditions that have nothing to do with cancer, and (2) t as a matter of fact, many epithelial and other cells in the course of t activities, contain or produce granules of the most varied chem nature. Thus, the superficial cells of the stratum Malpighii pro eleidin or keratin granules; many gland cells (salivary, pancreas, peptic cells) deposit zymogen granules; and various leucocytes pro large and small granules (eosinophile, basophile, and amphophile gran

&c.). [F. Heidenhain has shown what remarkable appearances certain cells exhibit in the matter of particles in their cell substance staining differently from the nucleus and from the rest of the cell substance; appearances which put in the shade those described by the various authors as due to differently stained "spores" within the substance of some of their cancer cells. All these facts have to be carefully considered when undertaking to investigate the morphology of epithelial and other cells; to merely describe changes, of the sort I have noted, in the substance of cancer epithelial cells as due to the presence of psorosperms or of their spores, is a proceeding which is either due to inexperience and to a want of knowledge of elementary histological facts, or to a want of appreciation of what constitutes trustworthy evidence.

A third obstacle to acceptance of the parasitic theory of cancer is the normal horny change of epithelial cells. This has been entirely overlooked by some of the most prominent cancer parasitologists. Nucleated horny kerato-hyaline cells are undoubtedly present in the superficial layers of cancers occurring in connexion with the skin and the oral cavity. But in hypertrophied epithelium such as occurs in various processes associated with chronic inflammations of the skin or of the mucous membrane of the oral cavity, there are always found amongst the superficial layers of the stratified epithelium, certain cells which become conspicuous in sections stained first with rubin or fuchsin and afterwards with methyl blue. These cells contain a keratinous hyaline body, and a small shrunken nucleus; the former is transparent, but stained bright pink, the latter uniformly of deep blue colour. Even in sections stained with gentian violet, these cells are conspicuous by their deeply and uniformly stained small nucleus, and by their pale, purple, homogeneous cell body. In some sections such cells are so conspicuous that they stand out prominently and I presume, for this reason, have been assumed as something foreign in cancer. But a careful examination shows that they are unmistakeably epithelial cells which have undergone keratinous change. In sections through the superficial layer of the epidermis of sheep-pox, in similar sections of the vesicles of vaccinia and of cowpox, in the epithelium covering the lips, palate, and tongue, in foot-and-mouth disease, and in the nipple in inflammatory processes of the mammæ, these appearances are found as numerously as in cancer; and there is no difficulty in tracing their relation in the above-named diseases to keratinous cells, such as normally constitute the stratum lucidum or the superficial layer of the oral epithelium. In the sections, the keratinous parts of the cell are stained deep pink (by rubin or fuchsin), while the small, shrunken, homogeneous nucleus takes the methyl blue very readily. Various authors have, indeed, described and correctly interpreted these kerato-hyaline cells; but there are nevertheless others who, with Darrier, still consider them as parasites.

And, finally, there is obstacle to acceptance of the dictum which alleges the presence of spores in the nucleus of the cancer epithelial cell. Ruffer, "British Medical Journal," 1892, and others, notably Soudakewitsch, describe the growth and presence of numerous granules (spores of the parasite, they say) within the nucleus of the cancer epithelial cell. But in their description no valid grounds are afforded for differentiating these intranuclear bodies from changes in the nuclear chromatin. In fact, all these morphological changes may well be due, and probably are due, to the breaking down of the intranuclear chromatin; and it is particularly with reference to the changes of this latter substance in epithelial nuclei under various conditions, normal and pathological, that these statements of Ruffer and of other

observers are extremely deficient. These, and similar pheno
may or may not be due to the presence of spores; but before an
definite can be affirmed of them in this sense, the chromatin cha
nuclei under similar conditions of cell multiplication and cell dest
require careful study. Such study, so far as I can see, has not y
carried out.

From the various considerations I have adduced, it must be
that a number of assertions as to the parasitic nature, in cancer, of
bodies in the substance of the epithelial cells, of nuclear-like
between the epithelial cells, of encysted nucleated bodies, of
nucleated cells, of multi-nucleated cells within epithelial cells,
stained particles within the epithelial nuclei, take no account
presence of similar bodies and of similar change in epithelium tha
cancerous; and until such comparative study of the epithelium in
and in disease has been undertaken, statements to the above effect
claim that value which their authors attribute to them.

But I have not completely exhausted the list of difficulties
beset a theory of parasitic cause for cancer. Not least among
that remain is the circumstance that few observers describe the
kind of parasite. One might almost say that there seem to
many kinds of cancer parasite as there are writers thereon
further, that the morphological characters of most of these
parasites do not conform with the characters of any of the
psorosperm species.

A notable exception is however to be made in the case of L. P
His numerous researches* testify not only to his thorough and ext
knowledge of the subject of undoubted parasitism of sporidia
animal kingdom, but also in a very high degree to his systematic
tigations of the characters and occurrence of these and similar b
Whatever, therefore, he has to say on this subject should com
universal and respectful attention. We may differ from him, and
hold that his generalisations, notably with reference to the same kin
parasitism in variola, vaccinia, varicella, herpes, variola ovina, an
other vesicular diseases, are by no means satisfactorily established by
evidence he adduces; nevertheless he makes a genuine scientific
systematised attempt at throwing light on what is shrouded in dark
and what is considerably complicated by the many less exte
investigations and somewhat hasty assertions of a great numb
young pathologists.

Omitting, as outside the scope of this critical review, Pfeiffer's st
of the nature, character, and distribution of coccidia, klosia,
eimeria, and of the sporidia (myxo, sarco, and micro-sporidia), I tu
his observations on amœbo-sporidia in cancer in the human sub
According to him the parasite of cancer is found either within
epithelial cells in the form of an intracellular encysted spor
around the epithelial cells as a free and growing cell-like
which, when enlarging, resembles a nucleated protoplasmic cell;
cells as are always found numerously infiltrating the connec
tissue around the true cancer epithelial masses. That is to
Pfeiffer considers the various intracellular bodies as spores, and
leucocytes infiltrating the connective tissue as the growing c
parasites. Views of this kind, which, on the one hand, cannot

* "Die Protozoen als Krankheitserreger" Jena 1890, "Untersuchungen üb
Krebs," Jena 1893, and "Der Parasitismus des Epithelcarcinoms," "Centralb
Bakt und Parasitenk," vol. xiv., page 118.

accepted as based on anything like evidence, but rather as a sort of *ipse dixit*, cannot, on the other hand, be directly disposed of. In just the same way it is open to anyone to affirm that the white blood cells found in inflammation, &c., are amœbo-sporidia, though other persons may prefer to call them inflammatory cells, exudation cells, or leucocytes. They all are, whatever we call them, living independent organisms which grow and multiply. If it be contended that they, being normal constituents of the healthy body, cannot be the parasites of cancer, it might be answered that the amœbo-sporidia of Pfeiffer's are not identical with them; that the normal white blood cells are one species, and that the amœbo-sporidia are a different pathogenic species. I am merely showing the kind of argument that Pfeiffer could bring forward if he chose to go beyond his *ipse dixit*. And nothing is gained by studying Pfeiffer's photograms (l c., Plate 1, Figures 1–4), representing sections through epithelial cancer of the pectoral muscle and the lip of man, which are submitted by him as illustrating amœbo-sporidia. What is represented by him under a low magnifying power (× 60) may be anything; whereas the appearances shown (Figure 4) under a magnifying power of 600, are nothing else than a cluster of nuclei, which may be those of epithelial cells or of leucocytes.

Pfeiffer's researches, indeed, though systematic and exhaustive so far as they refer to the nature and distribution of coccidia and allied psorosperms, and to the various sporidia in the animal kingdom, are extremely fragmentary with reference to cancer in man; there is practically no satisfactory evidence of the presence of what Pfeiffer calls spore-forms in the cancer epithelial cells, or of the presence of amœba forms around them.

One of the most striking facts in the large mass of the literature on the subject of coccidia and psorosperms in cancer, is the absence of any well authenticated sickle-like bodies; that is to say, of those characteristic bodies which, according to the unanimous testimony of all those who have investigated the life history of the various parasitic and non-parasitic coccidia and psorosperms (Leukart, Bütschli, Eimer, L. Pfeiffer, and others), constitute one of the most typical phases in the life cycle of a coccidium—the phase, namely, of commencing germination of the spores. True, there have been a few observers (Soudakewitsch, for instance), who assert the occurrence in cancer of sickle-like bodies, but most other observers deny their relation to cancer, and regard them as altered nuclei. There is no difficulty, whatever, in finding in cancer, as also in other chronically and acutely changed epithelium, nuclei of the epithelial cells which resemble, or rather possess the shape of, crescentic or sickle-like bodies; nuclei, that is, which are so changed that they appear swollen or hydropic, with their chromatin collected at one side in the form of a crescentic body. So that the only typical phase, *i.e.*, sickle-like germs, of a coccidium or psorosperm, the constancy of which would represent a certain morphological evidence for the presence of coccidia or of psorosperms in cancer, is absent. As a consequence, therefore, the acceptance of other phases of the alleged coccidia in cancer constantly met with in the writings of parasitologists is beset with very grave difficulties.

Briefly reviewed the following are the conditions which have been described as indicating psorosperms or zoospores in cancer:—

1. There is, in the first place, the occurrence of encysted nucleated protoplasmic bodies amongst the epithelial cells of cancer, which resemble, to a limited extent, similar bodies in, for instance, the coccidia in the rabbit's liver. With reference to these encysted cells it has to be

said that such forms do undoubtedly occur in cancer. I have exa
a considerable number of sections through cancer—of the lip, and
of the penis, of the liver, of the omentum, of the breast, of the bl
and of the œsophagus—and have met with such encysted cells.
have met the same bodies in stratified epithelium of a variety of
in normal, and particularly in pathological, conditions which
nothing to do with cancer. Hence I am justified in denying
parasitic nature, not only because they occur in normal str
epithelium, but also, and chiefly, from the fact that in every
they resemble epithelial cells wherein the main body of the prot
has shrunk around the nucleus, leaving a peripheral portion surro
it like a capsule. Whether this apparent encysting of nu
epithelial cells is connected with and dependent on the str
differences of the marginal and central portions of the cell prot
as is suggested by Heidenhain's researches, I am unable to sa
as evidence at least tending in this direction, I may state
however partial or extensive coagulation-necrosis occurs in e
epithelium, such apparent encysting of the main coagulate
of the epithelial substance does occur. To this class of appe
belong epithelial cells in which the nucleus is shifted to o
and compressed, owing to the presence within the central
the cell of an almost homogeneous spherical body; and
remnants of granular matter may be often recognised. These
intracellular globules are represented by some observers as the
parasites; but apart from their remarkable dissimilarity to a
resembling a sporozoon, the possibility of their being indicative
due to a hydropic or colloid change of the cell protoplasm must
lost sight of. Moreover, the presence of fluid colloid fatty ma
other material within the cell protoplasm, is not at all of rare occ
in epithelial and other cells in various pathological states.

2. The presence of well-outlined, more or less clear, intrac
bodies showing a more or less distinct peripheral radial *striation*
a central deeply stained granule or granules (Soudakewitsch, *Ba*
These strikingly resemble altered nuclei of the epithelial cells: th
in a hydropic condition with accumulation in the centre of the
part of the chromatin, remnants of the mitoma still attachin
chromatin to the nuclear membrane. I do not miss these for
cancer, in fact they are by many considered to be the most charact
forms. But in some cancers that I have examined they ar
numerous; and I do not see that the evidence as to their pa
nature is at all satisfactory, the less since bodies closely resembling
forms are to be met with in epithelial structures under other condi
as already stated. It is quite possible that in cancer the changes
nuclei in epithelium are of a chemical nature different from
obtaining in other conditions, and that hence they are more easil
with in cancer than in other diseases; but this is no reason why
changes should be considered as indicating the presence of parasites
passing, it may be mentioned that these bodies do not occur in
coccidia, say, of the rabbit's liver.

3. The presence of "spores" and "spore-like" bodies in the
substance and in the nuclei of the epithelial cells in cancer,
isolated or in groups. To these, Sjöbring, Soudakewitsch, Ruffe
Walker have devoted particular attention; and they undoubtedly
sent good types of the so-called cancer parasites which can be
studied. But, as I have stated, such "spores" cannot be distinguishe
masses of cell protoplasm or of nuclear substance respectively, sep

from the main cell substance, and owing to chemical change taking dyes often differently. Besides such spore-like bodies are met with in epithelium under conditions (sheep-pox, foot-and-mouth disease, chronic inflammation of skin, &c.) that have nothing whatever to do with cancer. It must, however, be left open whether this interpretation is or is not a correct one; though amongst the figures given by the different observers as showing intracellular spores (Sjöbring, Ruffer, and Walker) there are some that cannot be distinguished from vacuoles in the protoplasms of epithelial cells.

4. As to the presence of rounded transparent cells with one, two, or more nuclei amongst, or even within, the epithelial cells, there is nothing to distinguish them from ordinary leucocytes. They are met with in cancer, and they are met with in the normal epithelium of the palate, tonsil, and back of the tongue. To assume with L. Pfeiffer that these are amœbosporidia seems quite gratuitous. The same applies to the kerato-hyaline cells already mentioned, and which are said to be a phase of the cancer coccidium.

5. Perhaps the most important bodies that have been adduced as cancer parasites have not yet been mentioned by me. They are those described by Korotneff in "Centralblatt f. Bakt und Parasitenk," vol. xiii., p. 373. Under the name of *rophalocephalus carcinomatosus*, Korotneff describes a pedunculated and band-like protoplasmic mass, consisting of a spheroidal or pear-shaped nucleated "head," and, directly continued from it, a band-like longer or shorter protoplasmic mass. The whole is without a sheath and is situated partly within and partly without the epithelial cells of a cancer; and the band-like stalk is several times the diameter of the individual epithelial cells. In this form the "parasite" is considered as an adult one, whereas smaller uni, duo, or pluri-nucleated masses without stalks are considered young or growing forms—gregarina forms. This parasite was found not only in carcinoma labii but also in carcinoma mammæ, maxillæ, &c. Kurloff in "Centralblatt f. Bakt und Parasit," vol. xv., p. 341, adduces confirmatory evidence as to the existence of these forms: namely, adult band-like masses with a nucleated head, and also smaller spherical, oval or pear-shaped masses (*i.e.*, growing forms) in a case of carcinoma of the skin of the hand.

These band-like masses with nucleated pear-shaped head, are from their shape and their size so unlike anything else amongst the epithelium that it is quite out of the question to refer them to anything belonging to the epithelial or to other known cells, and the question therefore arises as to their nature and as to their relation to carcinoma. Both Korotneff and Kurloff show that by special staining they can be easily demonstrated; and in this I agree, so far as their presence in some carcinomata is concerned. I have seen identical bodies in sections of a carcinoma of the œsophagus, which were stained first in fuchsin or rubin and then in methyl blue. They were conspicuous not only by their shape but also by their deep pink stain (fuchsin or rubin) which they take up and retain with great persistence. They appeared as partly intracellular, more generally intercellular, filamentous, or band-like deeply stained masses with a spheroidal or pear-shaped nucleated enlargement; and in this form they are easily recognised. Besides such forms there occur similar deep-pink spheroidal or oval nucleated intracellular masses; and it is difficult to decide whether all these or only some of them, notably the larger ones, are merely truncated enlargements of the former. The smaller of such forms are, most probably, young growing forms, as is maintained by Korotneff and Kurloff; but it must be obvious that the "rophalocephalus" may appear

in the specimen in longitudinal, in oblique, or in transverse section, a matter of fact gradations between the long band-like adult (so forms and the spherical or oval nucleated bodies, can be easily ob I myself cannot say whether the smaller uni, bi, or multi-nu intracellular corpuscles referred to by these authors are in reali they appear to be, namely, young and growing forms; or w they are merely the "heads" of the band-like forms seen in opt in real transverse section. If the former view, viz., that of Ka and Kurloff, be the right one, some of these young amœ nucleated bodies (gregariniform) have been described by other ob notably by Sawtschenko and Ruffer.

It may not be amiss to mention here that it seems to me that some rate, of the "fuchsin bodies" first described by Russell, "British J Journal," 1891, belong to this category; and it may also be m that others of Russell's fuchsin bodies are red blood corpuscles, some carcinomata red blood corpuscles deeply stained with fuch be found between the deep epithelial cells. That they are red blo puscles can be recognised by their size and shape, and by the fa the capillaries of the papillæ contain them. But some of the "fuchsin bodies" of Russell seem to me to be undoubtedly the parasite-like bodies.

There can be then no doubt that there occur in cancer certain which can be distinguished as separate and different from epi cells, from nuclei, or from leucocytes; and the question is, Of nature are they? The two Russian authors consider some of th rophalocephalus carcinomatosus in its adult stage, while the s nucleated bodies they consider as young growing gregarinous form seems to me, however, that it is not necessary to accept this vie new species, one which by the way does not coincide in its char with any known gregarinæ. It appears more probable that the like pedunculated knobbed nucleated mass of protoplasm repr simply a large amœba that has thrown out a long stalk, and when the amœba, after the nature of amœbæ, divides it gives o to smaller nucleated protoplasmic masses. If only the latter present in the sections, it would, owing to their special staining and intracellular position, not be difficult to mistake them for epithelial or leucocytes; but the presence of the large pedunculated kn masses are of the utmost importance as proving that we are de with something quite different from either epithelial cells or leucocy

I have searched for these pedunculated amœbæ in a large nu of carcinomata; but, excepting in a single case of carcinoma o œsophagus, I have not come across them. As already stated, how Korotneff has in this respect been more fortunate.

To sum up, then, we have to exclude from the evidence ad by the various authors, as indicating cancer parasites, the follo bodies:—

(*a.*) Nucleated epithelial cells which have undergone a kerato-hy change. These are observable as spheroidal or oval corpuscles, gene situated away from the deepest epithelial cells; that is, from the immediately in contact with the connective tissue matrix. The of about the size of ordinary epithelial cells, stain like keratin o superficial cells, and possess a relatively small deeply stained shru nucleus, such as is found in many other examples of chemical acutely inflamed epithelium.

(*b.*) Spherical transparent cells with one, two, or more nuclei, v in aspect, size, nuclei, and in their mode of staining, cannot be

latter forms are in many cancerous epithelial growths onl met with; in some I have missed them altogether, while sections had to be examined in order to find one or the bodies resembling them. From this it would appear haz them a definite causative relation to the rapid growth a of the epithelial cells constituting carcinoma.

No. 4.

Further Report on the Etiology of Vaccinia; by Dr. Klein, F.R.S.

In my last report, 1892–93, on the Etiology of Vaccinia, I stated my experience as to the paucity of bacteria in vaccine lymph, whether from the calf or from the human subject, taken under due precautions at that stage in which it is commonly used for vaccination purposes. Thus, I recorded the fact that if—in the case of human vaccinia on the 8th day, of the calf on the 5th or 6th day—the superficial layer of the vesicle be thoroughlycleansed and removed, and the lymph thereafter oozing from the pock be collected in sterile glass capillary tubes, inoculation of the lymph thus obtained into various nutritive media* only exceptionally results in growth therein of any micro-organisms. Further, I noted that the like was true of small-pox lymph, collected in a clear state at a not too forward stage of the small-pox vesicle. And I went on to infer that the cocci, bacilli, yeasts, &c., which have by so many observers been grown in culture from vaccine lymph, are by no means essential constituents of the lymph; that, on the contrary, they are of extraneous origin, having been derived in all probability from the superficial crust, or added to the lymph from other outside sources during the process of collection.

In the report in question I also pointed out that short bacilli are present in suitably stained cover-glass specimens of lymph taken from the pock of the calf at an interval at 72 to 96 hours after vaccination. In some specimens of early lymph these bacilli occur in very great numbers, in later lymph their number is not so large; and I have surmised that their scarcity in late lymph is probably due to the disappearance of the bacillary substance of the microbe in sequence to its formation of spores. Illustrations appended to my report displayed these bacilli in early lymph in pure culture. In addition, I showed that in human vaccine lymph on the 8th day of the vesicle, as also in the clear lymph of human small-pox at 3rd and 4th days of the eruption, similar small bacilli could be recognised; and that, invariably, these bacilli refused to grow in artificial culture on or in any of the media used by me to that end.

Two publications have since appeared which deal with this subject:—

(1.) Besser: Centralbl. f. Bakt. und Parasis., Vol. XIII., p. 590: finds in the lymph of human small-pox a small bacillus corresponding morphologically to that described and figured by myself; but which, unlike my small-pox bacillus, is capable of being grown on the ordinary culture media. For this reason I do not consider this observer's positive result as free from doubt; indeed I feel certain that the bacillus cultivated by Besser is not identical with that which I found in small-pox lymph.

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* The media experimented with were:—ordinary nutritive agar, glycerine agar, and blood serum in fluid and in solid condition.

(2.) The second publication referred to is by Dr. Butters
appeared first in the "Deutsche Med. Wochenschrift 1893," No.
was afterwards published in full in the "Arbeiten aus dem
Gesundheitsamte," vol. ix., part i., p. 96. This observer finds in
lymph, dried on cover-glasses, a dense network of threads wit
are associated a number of granules; and he concludes that these
are peculiar to vaccine lymph, since he finds them in no other ex
fluid of the skin. Further, he considers the threads as the
vegetative part of a vaccine fungus, and the granules he regards
of the same. To those acquainted with the various classical publ
that have come out in the Kaiserl. Gesundheitsamte,* the appe
Dr. Buttersack's paper therein must have caused surprise;
least, in view of the method by which he achieves his results,
drying of a thin film of lymph on a cover-glass, and then (so
staining it in suitable dyes. Although a host of competent work
worked in the same direction—Koch and his colleagues at t
Gesundheitsamte amongst them, and be it noted by exactly
method that Buttersack describes as a new method—not one
mistaken threads and granules of fibrin, or of some other alb
substance, for a mycelium with spores. The features described
tersack are, he admits, not always present; and the reason he as
other observers having missed them (viz., that they are not visibl
fresh state but only after drying) is on the face of it altoge
sufficient. Though I do not doubt that in his dried specim
lymph Buttersack found all the features that he describes, ther
the smallest reason for accepting them as indicating the presen
micro-organism, or for crediting that they were discovered by
the result of a new method.

During 1893–94 I have further attempted to cultivate vaccine
seeking thereby demonstration that the bacilli found by me in the
of the early vaccine vesicle of the calf are actually *living* orga
For this purpose two methods have been employed:—

(1.) *Direct cultivation.*—As in last year's experiments, lymph
collected from successful insertions in calf pox; the vaccine l
being taken from calves in use at Lamb's Conduit Street for the va
tion of calves and infants. In each instance it was proved to be
lymph in the routine processes of that Establishment. Before taki
lymph the surface of the pock was well cleaned, and the superficial
removed with a sterile scalpel; then, the pock having been cl
between sterile vaccine forceps, the clear lymph oozing out was al
to run into freshly drawn out capillary glass pipettes. From these pip
inoculations were made of different culture tubes. As culture ma
I used:—

(*a.*) Ordinary nutritive agar, solid.
(*b.*) Glycerine agar, solid.
(*c.*) Fluid horse-serum.
(*d.*) Solid horse-serum.

* Koch's papers on Anthrax, on Disinfection, and on Tuberculosis; Gaffky's
on Typhoid Fever; Löffler's papers on Diphtheria and on Glanders; Schutz' pa
Glanders, Swine Erysipelas, &c.; Hueppe's paper on Milk-fermentation;
paper on Air Organisms; and a host of other most accurate papers on
bacteriological subjects, all of them marked by precision of method, trustwo
as to fact, and care in drawing conclusions.

Serum of the horse was chosen since it can easily (more easily than ox's serum) be obtained in large quantities in a clear state, and on account also of the horse being an animal susceptible to cow-pox.

Each culture tube received a drop of the vaccine lymph, which in the case of the solid media was rubbed over the surface with a sterile platinum loop. The tubes were next all "capped" so as to avoid loss of fluid and drying up, and were incubated at 37° C. I have thus made cultivations :—

(1.) In one instance of 72 hours' lymph.
(2.) In one instance of 68 hours' lymph.
(3.) In four instances of 96 hours' lymph ; and
(4.) In two instances of 100 to 112 hours' lymph.

In each series, that is to say from each actual sample of lymph, there were made—

(*a*.) Three cultures on ordinary agar.
(*b*.) Three cultures on glycerine agar.
(*c*.) Three cultures in fluid horse-serum, and
(*d*.) Six cultures on solid horse-serum.

The cultures were kept under observation for over three weeks, but in not one single tube was there any growth obtained: they all remained sterile. We have then here a considerable number of cultivations, and yet not one showed any growth. This result coincides with last year's (1892–93) observations, and with those recorded by other observers.

(2.) *Indirect cultivation.*—In the course of other studies I had observed that on inoculating, subcutaneously in the groin, guinea pigs with vaccine lymph, the inguinal glands of the inoculated side could on the fourth and fifth days be distinctly felt as slightly enlarged. On the sixth and seventh days this enlargement was a little more marked, and afterwards it gradually subsided. Hence I thought it possible that this enlargement, appearing as it did after lapse of three days, might be due to the growth and multiplication in the guinea pigs' tissue of an organism ; possibly the vaccine organism. I therefore—

(*a*.) Inoculated two guinea pigs *subcutaneously* in the groin with a few drops of active (sixth-day) calf vaccine lymph. The animals were killed on the eighth day; when the inguinal glands of the inoculated side were found slightly enlarged, and the connective tissue around them infiltrated with sanguineous matter. These glands were then cleared of all their surrounding tissue, and, an incision having been made into them, disc-shaped particles (each about the eighth of an inch in diameter) of the gland tissue (which was rather juicy) were cut out with sterile scissors for transference to culture tubes. With each particle, two agar, two glycerine agar, and two solid horse-serum tubes were inoculated, by rubbing the particle well over the slanting surface. The tubes were then capped and placed in the incubator at 37° C. Altogether from each guinea pig, 12 culture tubes were inoculated. The tubes were inspected from day to day for four weeks; but not a single one of them showed any growth; they all remained sterile.

(*b*.) Two calves were next inoculated *subcutaneously* in the groin with a few drops of active calf vaccine lymph, each animal receiving the contents of three ordinary calf vaccine tubes. The inguinal glands of these calves on the inoculated side, were then watched from day to day.

On the sixth and seventh days they were for the mos
felt; on the eighth day they were distinctly enlarged. A
were cut out, and cultures were made with them
on serum; but these media remained perfectly sterile.
any kind appearing in them.

No. 5.

Preliminary Report on the Chemical Pathology of acute Traumatic Tetanus; by Sidney Martin, M.D., F.R.C.P.

I have in my previous reports on Anthrax, on Infective Endocarditis, and on Diphtheria shown that the poisonous chemical substances found in the blood and tissues in these acute infective disorders, belong to two classes; and that these poisons are in each instance formed by the transformation of the proteid substances present in the body, *i.e.*, by a process of digestion.

The poisons of the two classes are:—

1. The digested proteids; albumoses.
2. The final products, some of which are acid bodies and some basic.

As regards the physiological action of the albumoses, in the three diseases so far examined they are fever producers, and moreover possess a special action (in rabbits) on the heart, whereby the cardiac muscle undergoes fatty degeneration, the skeletal muscles being unaffected. The diphtheria albumoses have, however, a further and special action in that they produce a paralysis due to a degeneration of the peripheral nerves, sensory and motor; while in large doses they act on the spinal cord as a paralysing agent. The final products, in infective endocarditis and in diphtheria, are acid bodies, and they possess only a feeble toxic action. But in anthrax the final product is a basic body which produces coma and is the chief agent by which death is caused. The final products are not, like the albumoses, to any great extent, if at all, fever producers.

The Chemical Pathology of Tetanus.

In my study of the chemical pathology of tetanus, I have proceeded in a manner similar to that observed in my investigation of Diphtheria, viz., by making, first of all, a chemical examination of the tissues of patients dead of the disease. In the present report I confine myself to the results obtained in this sense, reserving the examination of the chemical substances produced by the bacillus of tetanus in artificial culture for a future report.

Acute traumatic tetanus is a disease in which, following a wound or injury, there arises a series of symptoms which are quite characteristic, viz., fever and recurring convulsions.

The wound may be a penetrating one, and may contain a foreign body visible to the naked eye, such as a splinter of wood; or the injury may be a compound fracture of a limb, or even a mere abrasion. In some instances no wound is discoverable.

The wound is the seat of inoculation of the disease, and its examination chemically presents great difficulties. In cases where it is simply an abrasion which has already been treated surgically, no chemical examination would be of service. In one such case I have tested the infectivity of the wound by inoculating material from it into rodents; but no effect was produced. In cases of tetanus following a penetrating wound, from which there is found exuding a small quantity of ichorous pus, the infectivity of the wound has been tested by various observers; but I have not been fortunate enough to obtain sufficient of this pus for chemical examination. The study of the chemical pathology of tetanus is somewhat hampered by these difficulties, inasmuch as it is possible

that the examination of the local lesion would, if practicable, yi
interesting results as in the case of the diphtheritic membrane.

Subsequent to infliction of the wound there occurs, in tetanus, a pe
incubation, after which there is onset of spasm of the muscles, fac
limb, and trunk muscles, along with a rise in body temperature.
recurring spasms need no description here; they are slight at fi
become more intense, lasting till death. The fever lasts through
illness; it may rise higher, or may fall, just before death.

The higher cerebral centres are not affected, and the chief infl
the poison is exerted on the motor nerve cells.

One other symptom is frequently noticed, more especially tow
end of the disease, viz., increased rapidity of the cardiac beat, in
cardiac failure. This symptom may partly be ascribed to the
of the muscular spasms; but not wholly, since cardiac failur
infective disease is one of the effects of the action of the
producing it.

The tissues of the body that I selected for examination in teta
the blood, the spleen, and the spinal cord. The blood must,
be a chemical poison peculiar to this disease, be the means of i
mission through the body. The spleen was selected for exa
owing to the fact that in diphtheria, where this organ is not enl
is the chief repository of the chemical poisons that character
malady; and it was thought that a similar condition of things mig
in tetanus. The spinal cord was examined chemically, for the rea
in tetanus the poison appears to select the motor nerve cells
specific action, just as strychnine does; and it seemed, therefor
possible, indeed probable, that part of the tetanic poison migh
death be present in the spinal cord.

Cases of Tetanus examined.

The cases of tetanus examined were obtained during the last
years (1891–1894) at the Middlesex, St. Thomas's, St. Mary's,
Northern, and University College Hospitals.* They were seven i
and they presented some variety as to their symptoms during life.

Nature of Injury.—Six of the cases showed a seat of injn
which the tetanus poison might have entered. Two were cas
compound fracture (Cases II. and VII.): in one, fracture of a
tarsal bone caused by a pickaxe, in the other, fracture of the fo
Two were penetrating wounds of the soft tissues: in one, of the s
the foot by a nail; in the other, of the back of the right thigh nea
gluteal region, by an iron spike, a piece of the trousers being driv
(Cases I. and IV.). In two there was a superficial wound or abr
in one, a wound of the scalp caused by striking the head agains
curb of the pavement; in the other, an abrasion of the shin of the
leg (Cases III. and V.). In one only of the seven cases was
no wound, fracture, or abrasion discoverable during life or
death (Case VI.). The man in question fell with a sack of flo
to his right side; but there was no lesion. Some acne pustules
on the chest were suggested as possible seats of inoculation, but
can only be considered as mere surmise. It is quite possible,
the infection took place in this case by way of one of the m
membranes (the nasal, buccal, or pharyngeal), and was conveyed i
dust raised by the heavy fall of this big man with a sack of flour.

* I wish to express my indebtedness to the kindness of Mr. A. Q. S
Dr. W. Edmunds, and Dr. Galloway for sending me specimens from c
tetanus.

case is to be regarded as one of those described as idiopathic, *i.e.*, as occurring without any open wound.

Period elapsing between the Injury and the Onset of Symptoms.—Cases of tetanus may be divided in this respect into two classes. In one the onset of symptoms occurs in the first week,—from the third to the seventh day; in the other class it is delayed to the tenth day or later. In five of the cases observed (Cases I., II., III., V., and VI.), the symptoms appeared in the first week; in one (Case VII.) on the ninth day, and in one (Case IV.) on the twelfth day.

Symptoms observed.—The symptoms observed were those seen in all severe cases of tetanus, viz., tonic and clonic spasms of the muscles; slight at first, and gradually increasing in severity up to death. Fever was present in all, and tended towards hyperpyrexia in one case (VI.) for three days before death. As to Case IV., which differed from the others in so far that the onset was delayed until the twelfth day, there was only a moderate number of spasms, and rise of temperature only during the last two days of life; death occurred from cardiac failure, which was evident during the last three days of life. In Case VII., in which the onset of tetanic spasms was delayed until the ninth day, death was sudden.

The treatment of the wound in relation to the symptoms is important. In Case I. the wound was not excised, and at death it contained a small quantity of ichorous pus. In Cases II. and IV. the wound was not excised, but was treated antiseptically. In Case V. no special treatment of the abrasion was adopted. In Case III. the scalp wound was excised immediately on admission into the hospital for tetanus, seven days after the injury. The symptoms of the disease were, however, in this case, as severe as in those with un-excised wounds, and, like them, the case ended fatally. This case is important, since it shows that in one week after the injury sufficient of the virus had entered the body from the local lesion to produce a fatal result. In Case VII., the surgical treatment of the wound was successful, and in spite of the laceration of the parts no suppuration had occurred.

The features of tetanus, which it is desired to emphasize from the point of view of this report are: the period of incubation; the gradual onset of the disease; the gradual increase in severity of the muscular spasms; the irregular fever; and the tendency to death from cardiac failure. These facts suffice to indicate that acute traumatic tetanus is an infective disorder. The gradual onset of symptoms seems to imply, too, a gradual accumulation of poison in the body.

Death occurred in five of the cases examined in from 7–10 days from the onset of tetanic symptoms: in two of the cases, in three days. The fatal result is to be ascribed, not to one cause but to several. The continued tonic and clonic spasms lead to exhaustion, and to asphyxia through affection of the muscles of respiration. The state of fever contributes also to the fatal result. The effect of the poison on the heart is one not usually recognised as a cause of death, though this is probably a factor of great importance.

The post-mortem examination of the cases examined showed no unusual features. Besides the effects of asphyxia, as shown in cyanosis of the face and extremities, in sub-serous and occasionally sub-mucous ecchymoses, and in mechanical congestion of the liver, spleen, kidneys, and intestines, due to dilatation of the right side of the heart, no change in the organs or tissues was evident of a sort to account for death. The spinal cord of the two cases in which it was examined (Cases II. and VII.) showed no naked-eye change.

teids. If, therefore, an acid medium be used to extract the tissues, is quite possible that the poisonous bodies present would be decomposed, especially since the filtered acid extract has to be concentrated, thus increasing the degree of acidity. These remarks apply only to the examination of the tissues in disease the poisonous substances of which are unknown. If a base is known to be present, there is no objection to extracting it by means of solutions of mineral acids.

The exact manipulation employed may be described as follows :—

Extraction of Poisonous Bodies from the Blood and Spleen.—The tissue must remain under the alcohol until all its ordinary proteids are coagulated. This takes a varying time, but is accomplished in 2 to 3 days if a sufficiency of alcohol (short of a large excess) be used. As regards the spleen, after washing the organ, the capsule may be stripped off with forceps and the splenic pulp squeezed out with the fingers into absolute alcohol. In this way the soft pulp is separated from the fibrous tissue. If this pulp, along with the alcohol, is placed in a stoppered bottle and well shaken, the proteids are completely coagulated in 48 hours, and the process of extraction may be begun. This process is the same for all the tissues.

The alcoholic mixture thus obtained is filtered, and the yellow filtrate constitutes the alcoholic watery extract, which contains albumoses and other bodies with mineral salts. The residue on the filter is then extracted for 24 hours with distilled water, and afterwards squeezed dry through muslin and filtered. This is chiefly a watery extract. The two extracts are next mixed together and evaporated to dryness at below 40° C. *in vacuo* by means of a vacuum pump and a Liebig's condenser.

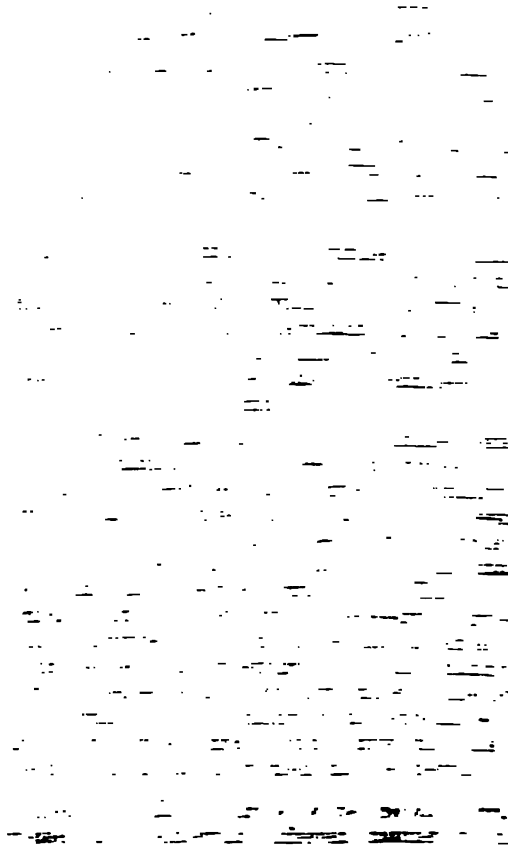
The dried residue is now treated in the evaporation flask with pure sulphuric ether, which dissolves out certain substances, leaving a copious residue. The ether and residue are poured out of the flask into a beaked glass dish, and the residue allowed to settle. This residue consists of a brown amorphous mass and of a whitish flocculent mass, both of which settle readily. The ether is poured off and filtered; it is of a yellowish colour. This is the impure *ether extract.*

The part left undissolved by the ether is now extracted with absolute alcohol until nothing more dissolves; the alcohol is poured off and filtered. This is the *alcoholic extract.*

The part remaining undissolved by the alcohol consists partly of mineral salts and partly of albumoses. In some cases, by treating this residue gently with distilled water, the albumoses enter first into solution, leaving most of the mineral salts behind. The yellow solution of albumoses thus obtained, is thrown into a large excess of absolute alcohol and precipitated.

The separation of the original extract of the tissues into an ether extract, an alcoholic extract, and albumoses, is readily performed by the above processes, which do not take more than four or five days. The crude extracts thus obtained have now to be purified.

The albumoses are readily purified. Precipitated in the form mentioned, they may have clinging to them some of the bodies soluble in ether and alcohol. These are removed in great part by allowing the albumose precipitate to stand under alcohol for a week or longer. Afterwards the alcohol is poured off, the albumose precipitate is then dissolved in a small quantity of sterile distilled water and re-precipitated by alcohol. After this second precipitate has settled (in 1–2 days) the alcohol is again poured off and the albumoses thrown on to a filter and well washed with absolute alcohol, ether, and chloroform. They are then removed from the filter by a sterile knife, placed in a glass dish and



Results of the Chemical Examination of the Tissues in Tetanus.

The blood, the spleen, and the spinal cord were, as has been said, chemically examined by the methods above described.

From the blood and spleen were obtained albumoses, and acid organic bodies in the ether and alcoholic extracts.

The final state in which the *albumoses* were obtained was in the form of a light white powder, completely soluble in water, and leaving a small quantity of ash on incineration.

The watery solution of this powder was yellowish, and gave the following reactions:—

1. Nearly neutral; if anything, slightly alkaline to delicate litmus paper.
2. No precipitate as a rule with nitric acid; one specimen only (from Case 1.) gave a doubtful precipitate. There was a well-marked xanthoproteic reaction.
3. A well-marked biuret reaction with a trace of copper sulphate and an excess of potash.
4. A flocculent and amorphous precipitate with neutral ammonium sulphate ($(NH_4)_2\ SO_4$), which precipitated all the proteid in solution.

These reactions show that the powder as obtained from the tissues consisted almost solely of deutero-albumose.

The ether extract is yellowish and amorphous, and not completely soluble in distilled water. The clear part of the mixture is yellow in colour and strongly acid; the insoluble part consists chiefly of fatty matter. All that can be at present said of the ether extract is that, besides fat, it contains strongly acid organic substances.

The alcoholic extract is almost completely soluble in distilled water. It is, like the ether extract, strongly acid, and is precipitated from an alcoholic solution by ether, in the form of small globules which run together into larger globules, and which dry in the form of a yellow amorphous mass.

The amount of these products obtained from the individual cases is shown in the following table:—

Tissue examined.	Amount of Products obtained, in Grammes.		
	Albumoses.	Alcoholic Extract.	Ether Extract.
Case I., blood - -	1·597	0·148	Not estimated.
Case II., spleen -	0·102	0·077	0·222
Case III. and IV., spleen	0·184	0·328	0·286
Case V., blood - -	0·124	0·341	0·140
„ spleen - -	0·268	—	0·617
Case VI., spleen -	1·930	—	—
Case VII., spleen -	0·322	Not estimated	Not estimated.

The amounts of albumoses, of alcoholic, and of ether extracts obtained from the blood and spleen of these cases of tetanus tend, as is seen from the table, to vary. But it needs to be pointed out that in all the cases

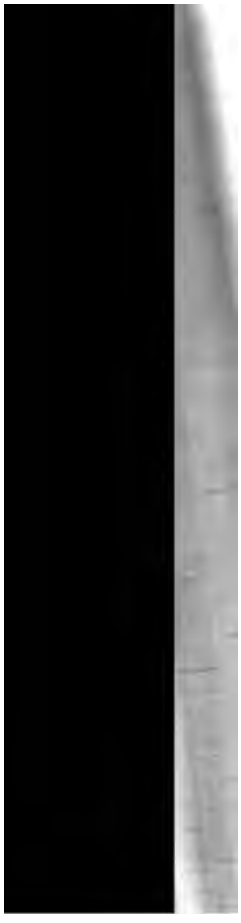
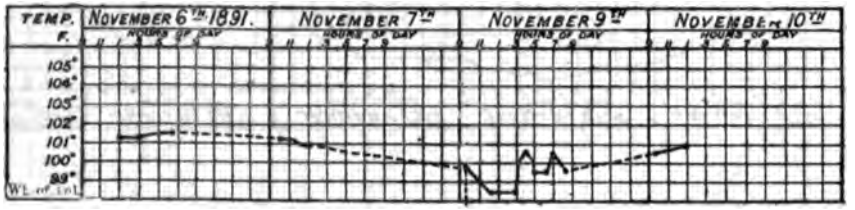


CHART I.

RABBIT weighing 1,150 grammes, intra-venously injected with 0·1615 gramme of tetanus *albumoses* from *blood* of Case No. I. Dose per kilo. body weight, 0·143 gramme.—Death in 21 days. Loss of weight, 500 grammes.



I. Time of injection.

Effect of Multiple Doses.—The three following experiments on rabbits illustrate the effect of multiple doses of the albumoses, whether obtained from the blood or spleen.

Following each injection of the albumoses, there was a rise of body temperature 2° or 3° F., and with a large total dose there was a continued rise of the body temperature for two or three days following the last injection. These results are shown in the following three charts :—

CHART II. (*a*.)

RABBIT weighing 2,100 grammes, intra-venously injected on each of two occasions with 0·062 gramme of *albumoses* from the *blood* of Case No. VII. Dose per kilo. body weight, 0·059 gramme.—No symptoms induced except slight fever. Complete recovery of rabbit, which was alive some five months later.

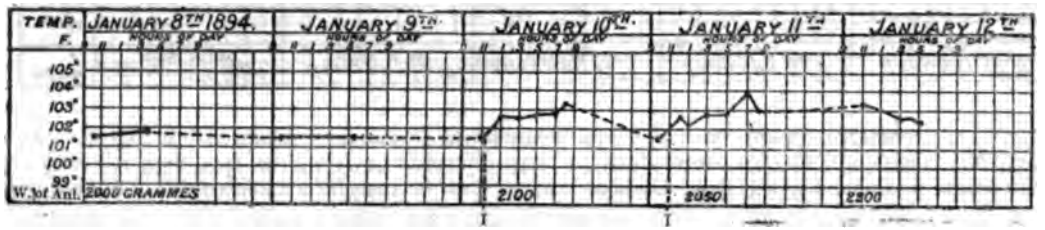
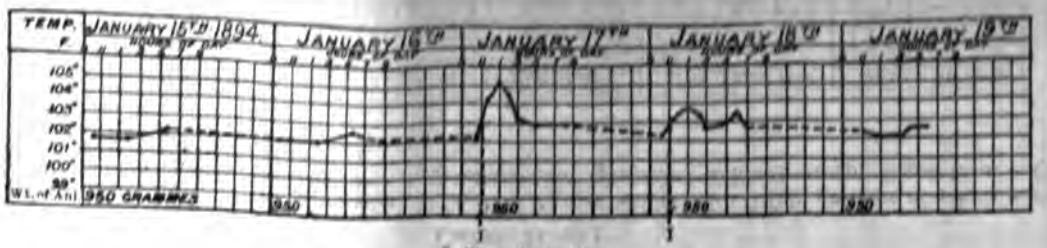


CHART II. (*b.*)

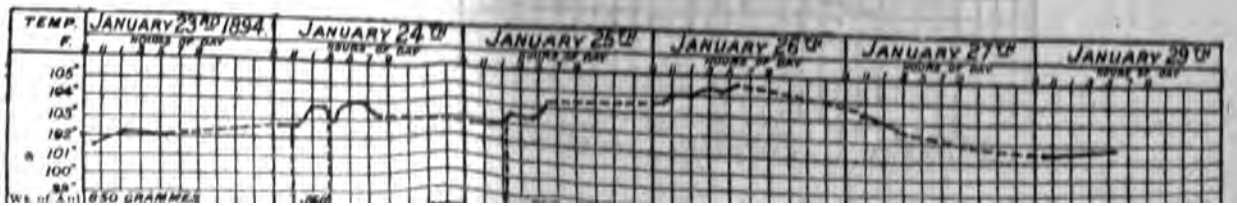
RABBIT weighing 950 grammes, intra-venously injected on each of two occasions with 0·570 gramme of *albumoses* from the *spleen* of Case No. VII. Dose per kilo. body weight, 0·16 gramme.—Rise of temperature after each injection; no other symptoms beyond loss of weight on sixth day of experiment to extent of 30 grammes, which loss was quickly regained.



I. Time of injection.

CHART II. (*c.*)

RABBIT weighing 850 grammes, intra-venously injected, twice on 24th January (0·056 gramme each time) and once (0·072 gramme) on 25th January, with *albumoses* from the *spleen* of Cases Nos. IV. and VI. Dose per kilo. body weight, 0·2 gramme.—Slight rise of temperature following two first injections; high fever after third injection, lasting three days. Animal quite well four months after experiment.



It is noticeable that in none of these three experiments was there an appreciable loss of body weight of the animal. Indeed, beyond the degree of fever which is shown in the charts, there were no symptoms observed. There were no tonic or clonic spasms of muscles, no variation in the knee-jerks, and no diarrhœa. These results are in marked contrast to those obtained with the albumoses of diphtheria, which without fail, in multiple doses, produce wasting and a generalised paralysis. The action therefore of the tetanus albumoses is similar to that of the albumoses found in anthrax and in infective endocarditis; viz., they are simply fever producers.

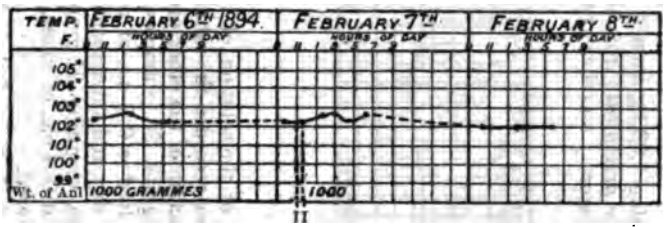
(*b.*) *Physiological Action of the Non-proteid Organic Substances separated from the Blood and Spleen.*

It has been previously stated that these bodies were divided into two classes; one insoluble in ether, and precipitated from its solution in alcohol by ether, and called the alcoholic extract, or the ether precipitate; the other soluble in ether, but also soluble in alcohol, called the ether extract. Both these classes of substances are, as separated, strongly acid, and, pending investigation of their chemical nature, which so far has been impossible owing to the small quantities obtained, they will be referred to as the *ether precipitate* and the *ether extract*.

Action of the Ether Precipitate.—The effect on the body temperature of *rabbits* of intra-venous injection of the ether precipitate (alcoholic extract) is a very slight one. In the experiments on rabbits illustrated in the two following charts, it is seen that a dose of 0·135 gramme per kilo. of body weight caused no rise of temperature, although there was a slight rise when a much larger dose (0·3 gramme) was given; a rise, however, which is not nearly so well-marked as with a much smaller dose of the albumoses.

CHART III. (*a.*)

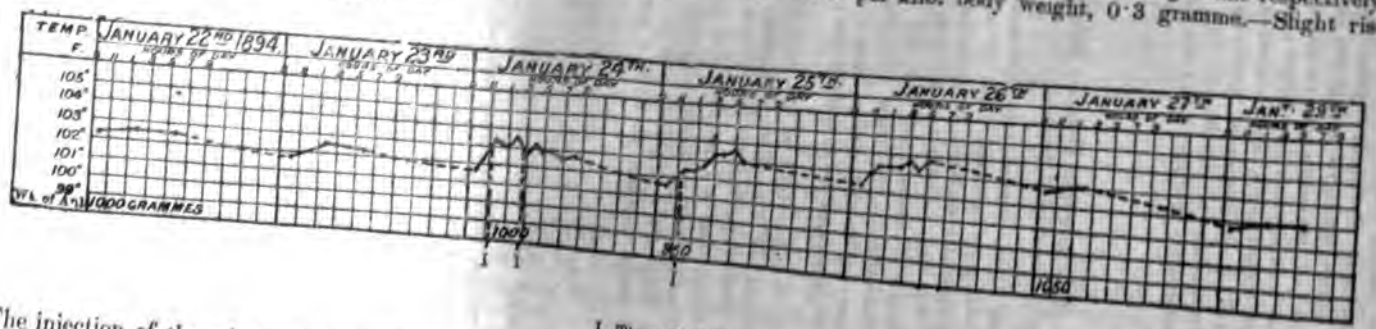
RABBIT weighing 1,000 grammes, intra-venously injected in two doses, 0.072 and 0·063 gramme respectively, with *ether precipitate* from the *blood* of Case No. VII. Dose per kilo. body weight, 0·135 gramme.—No fever or other symptoms.



I. Time of injection.

CHART III. (*b.*)

RABBIT weighing 1,000 grammes, intra-venously injected on three separate occasions, 0·09, 0·09, and 0·12 gramme respectively, with *ether precipitate* from the *spleens* of Cases Nos. IV. and VI. Dose per kilo. body weight, 0·3 gramme.—Slight rise of temperature; no other symptoms.



I. Time of injection.

The injection of the solution of the ether precipitate (almost a complete solution) produced no spasms of muscles; otherwise than in the sense above recorded the rabbits were apparently unaffected.

The general action of the ether precipitate was also tested on *mice*.

A mouse, weighing 26 grammes, received under the skin of the back 0·0124 gramme of the ether precipitate (from spleen of Case III.), dissolved in 0·1 c.c. of water. The animal was a little drowsy in two hours but [illegible] well on the next day and subsequently.

Another mouse, weighing 22 grammes, received und[illegible] dissolved in [illegible]

No. 6.

A Note on Influenza Colds; by Edmund Cautley, M.D.

In view of the fact that a definite microbe is associated with Epidemic Influenza, and of the circumstance that, clinically, it is not always possible to distinguish true Influenza from severe "cold," the question has arisen whether in ordinary "cold" (febrile nasal and naso-pharyngeal catarrh, extending frequently to the bronchi) the Influenza microbe is or is not present in the secretions of the implicated mucous membrane. Accordingly I have made bacteriological examination of the nasal secretion of individuals thus affected.

It is a well-established fact that some of these cases of nasal and naso-pharyngeal catarrh are distinctly infectious; so much so, that when one member of a household is affected every other person, living in the same house, is apt to take the disease in similar or in modified form. This being the case, it is reasonable to infer that the *fons et origo mali* is some kind of micro-organism. But it by no means follows that the same micro-organism is the cause in every series of cases.

As bacteria are constantly present in the air, they are of necessity deposited on the moist nasal mucous membrane during inspiration. In culture experiments by Von Besser, by Wright (New York Medical Journal,, July 1889), and by others, a variety of bacteria and cocci were frequently obtained from normal nasal secretion.

Von Besser (Beiträge zur Path. Anat. Bd. VI., pp. 346 *et seq.*, and Centralb. für Bacteriol, vol. V., No. 21, 1889) examined such normal secretion in 81 cases, and he found micrococcus liquefaciens albus in 22; staphylococcus pyogenes aureus in 14; bacillus striatus albus in 10; streptococcus pyogenes in 7; micrococcus albus in 9; micrococcus flavus liquefaciens in 3; Friedlander's bacillus in 2; and diplococcus pneumoniæ in 3. In 11 cases no organisms were obtained by cultivation.

Paulsen (Centralb. für Bacteriol. Bd. viij., 1890, p. 344) examined 38 such cases making 64 cultures from them, with the following results:—

11	culture	tubes	remained	sterile.
19	„	„	contained	10 colonies or less.
16	„	„	„	100 colonies or less.
12	„	„	„	more than 100 colonies.
6	„	„	„	an uncountable number.

He found that cocci were more numerous than bacilli; that many liquefying cocci were present; but that none were absolutely identical with pus cocci. In eight cases a "sulphur yellow coccus" in tetrads was present.

On the other hand in acute nasal catarrh Paulsen found staphylococcus pyogenes aureus in seven cases out of 24, and E. Fränkel in two out of four. Various other organisms have been found, and described by different observers, in the nasal secretion of acute catarrh. Hajek (Berliner Klin. Wochenschr. 1888, No. 33) described a micrococcus

nasalis and a diplococcus coryzæ. Klamann (Allgemein Central Zeitung, 1885, pp. 1344–1347) describes a micrococ and diplococcus fluorescens fœtidus in cases of ozæna. In s Hajek. (Münchener med. Wochenschr, 1887, No. 47) found fœtidus ozænæ, and Riemann (Inaug. Diss., Würzburg, 1887 the bacillus smarajdinus fœtidus.

It is, therefore, evident that numerous organisms are pres secretion, both in healthy and diseased conditions.

Passing now to my own observations, the clinical features examined consisted of febrile attack of varying severity, with of the nasal mucous membrane. The congestion generally e the mucous membrane of the sinuses in connexion with the n it extended to the posterior nares and pharynx. As a re congestion and of the consequent obstruction, there was often stuffiness with frontal headache. A variable degree of las general malaise was present. At first the nasal secretion wa scanty and viscid; in two or three days it became more p mucoid in character; later on it was muco-purulent. Duratio varied from a week to a fortnight.

Several difficulties were encountered in investigating the ba of these cases.

First and chief was the difficulty of getting into relatio sufferer in the early stages of his attack; at a time that is affection though not long established was affording suffici discharge for the purpose of making cultivations. Men ra under treatment for such attacks.

Secondly, in the later stages of the disease, when the nasal is muco-purulent, many organisms of secondary *import* present.

Thirdly, the nasal mucous membrane, even when healthy, numerous micro-organisms; and these are likely to be still pres acute catarrh begins.

Ten cases have been examined by me in the following n periods varying from one to five days from the onset of the s In each instance the nasal secretion was blown from the nost patient into a sterilised watch glass, and a trace of the mat rubbed over the surface of agar-agar and gelatine plates. Su on various media were then made from any colonies appearing in cultures.

The most typical case examined, and one which presented liability to error, is the following:—

Case I, *Male*, 34.—"Cold" commenced on September 29 much sneezing and with a little febrile disturbance. It was w next day and the catarrh had by then extended back into t pharynx. Total duration, one week.

Cultures were made from the nasal secretion, scanty though the first and second days of the attack. As regards the material:—An agar-agar plate at 37° C. showed in 24 hours

70 and 80 small round white colonies. Two days later the larger of these colonies were rounded, with a well-defined border, and had a distinct yellowish tinge. The smaller colonies had also a yellowish tinge and pale peripheral portion.

Subcultures made on *gelatine* showed, in 24 hours, a scanty growth of minute whitish round colonies along the line of inoculation. The growth resembled that of a streptococcus. Gradually the colonies enlarged and became white. Liquefaction of the gelatine began in seven days and increased very slowly, the gelatine not being completely liquefied until the end of three weeks.

Subculture on *agar-agar* at 37° C. showed, in 24 hours, a thick white raised growth with moderate deposit in the condensation fluid.

Broth at 37° C. became turbid throughout at the end of two days and contained a moderate deposit. This deposit remained scanty and became rather tenacious.

Microscopically, the microbe was found to be a small non-mobile staphylococcus.

The plate cultures made on the second day of the illness yielded colonies of the same organism in even greater profusion. In addition there were five colonies of moulds and one of staphylococcus albus.

In the particular case, therefore, the only organism obtained by culture, which could be thought of as perhaps the cause of the attack, was a staphylococcus with a fairly characteristic growth on gelatine.

But there are three objections which may be urged against it being the causal factor.

Firstly, It was not obtained by culture, except doubtfully in one, in the other nine cases examined.

Secondly, a staphylococcus apparently identical in its cultural and microscopical characters is sometimes obtained as a skin contamination.

Thirdly, free inoculation with the microbe of the nasal passages of an adult male, twice repeated, produced no result.

Case II.—The only other case in which the nasal secretion of acute catarrh contained any organism in anything like pure culture, was that of a man aged 27. Nasal secretion was obtained on the 4th day of his attack, and consisted of a profuse mucoid discharge with a little muco-pus.

A microbe in almost pure culture was obtained on an agar-agar plate at 37° C. It consisted of small whitish colonies, with darker centre and irregular crenate edges. On *gelatine* subcultures minute round whitish isolated colonies were formed in 24 hours along the line of inoculation. On subculture on *agar-agar* at 37° C., the colonies presented the same appearances as in the original culture but were rather smaller.

Microscopically, the organism proved a streptococcus.

Three colonies of a small staphylococcus were also obtained from this case. Its cultural characters were similar to those of the staphylococcus in Case I.; but it differed in that it grew more freely in broth and liquefied gelatine more rapidly.

As regards the other eight cases of catarrh examined by me were practically negative. They were all examined at a per to five days from the onset of the "cold," and in each case th consisted of mucus and a little muco-pus. I give the res as illustrative of the series, and as showing how many various were the organisms obtained.

Case III.—Male 28.—History of coryza for three days: m from the nose and feverishness. The discharge consisted o a little muco-pus.

Gelatine Plate yielded:—

1. Seven colonies of aspergillus and penicillium.
2. Two moulds forming a brown growth on gelati liquefying that medium.
3. One colony of sarcina lutea.
4. Four colonies of staphylococcus growing feebly on not liquefying it.

Agar-agar Plate at 37° C. yielded:—

1. Two moulds.
2. Three colonies of staphylococcus aureus.
3. Two colonies of sarcina lutea.

No. 7.

The Micro-Organisms found in the Bronchial Glands; by Edmund Cautley, M.D.

An important channel whereby micro-organisms can enter the system is the respiratory tract. The absorption of pathogenic micro-organisms from the interior surface of the healthy respiratory tract is a well-established fact, since direct experiment has shown that inhalation of anthrax spores will produce systemic infection, and that inhalation of dried tubercular sputum will give rise to general tuberculosis. Infection by this means is unlikely to take place through the thick mucous membrane, if healthy, of the nasal passages, trachea, and bronchi; it is much more likely to take place through the thin-walled air vesicles. With a view to ascertaining which of the numerous bacteria normally getting access to the respiratory tract are able to pass into the lymph stream, *i.e.*, into the lymphatic glands, the following investigations have been carried out.

With reference to tubercle bacilli, Pizzini (Rif. Med., Oct. 1891) has described the results of inoculations of guinea-pigs, made with material from the bronchial glands of a number of persons who had died from acute illnesses, or by accident. Although the glands had appeared microscopically, in every case, healthy, and though the body in no case showed signs of tuberculosis, he obtained the following results:—Out of 30 cases examined, 11 (dead of cerebral hæmorrhage, cardiac syncope, acute phosphorus poisoning, suicidal strangulation, suicidal gun-shot injury, fracture of the base of the skull, or by falls from scaffolding) had bronchial glands capable of infecting guinea-pigs with tuberculosis. And he argues that since 37 per cent. of these healthy persons, living in the open air and having no special dealings with phthisical patients, possessed bronchial glands which contained living infective tubercle bacilli, the tubercle bacillus is far more commonly distributed than is supposed. These observations would have been of very much more value if microscopical examination of these persons' bronchial glands had been made and had revealed the presence of the bacilli; considering the susceptibility of guinea-pigs to tuberculosis, the evidence hardly suffices to establish Pizzini's contention.

I myself have examined the bronchial glands in 25 cases.* In some of the 25, death was accidental or was due to acute disease; in the others the fatal disease was rather more prolonged.

The bronchial glands were obtained by me as soon as possible after death; placed for a few seconds in a saturated solution of perchloride of mercury to destroy any surface contaminations; then dried with sterile filter paper, and opened by an incision with a sterilized knife. Three gelatine and three agar-agar cultivations were in each instance

* As regards 20 of these cases (namely, all except Nos. 7, 12, 13, 18, and 19), examination of the Mesentric Glands was also undertaken, account of which will be found in the next succeeding paper of this volume.

[illegible] [illegible] [illegible] [

In 10 out of these 15 cases no organisms at all were found in the cover-glass preparations; in two cases only a single bacillus was found; in the other three a moderate number of microbes were seen. In none of the 15 cases was a single colony developed on gelatine at a temperature of 20° C. or on agar-agar at a temperature of 37° C. In other words, the bronchial glands, in 15 cases out of 25 examined, were sterile. It is especially noteworthy, that some of the above specimens were from cases, such as diphtheria and pyæmia, in which it would not have been surprising had their bronchial glands contained many organisms.

Case 16. *Female*, 40.—Pernicious anæmia. Glands of medium size. No organisms found in cover-glass preparations.

Agar-agar cultures yielded no growth. On one of the gelatine cultures a single minute transparent colony developed. Sub-cultures were made from this, as follows :—

Gelatine.—In 24 hours, numerous minute colonies.

Agar-agar.—In 24 hours, minute colonies on the surface, and scanty deposit in the condensation fluid.

Broth.—At 37° C. became turbid, and a scanty deposit settled.

Microscopically, the organism growing in these cultures proved to be a streptococcus.

Case 17. *Female*, 12.—Morbus cordis. Glands large and engorged with blood. Cover-glass specimens showed a few large rods with square cut ends; others in groups of four or five and a little curved. Also a few cocci.

Cultures proved sterile save for one small colony in one of the agar-agar tubes. Sub-cultures on gelatine, agar, and in broth afforded streptococci which presented the same mode of growth as, and microscopically were identical with, those of case No. 16.

Case 18. *Female*, 47.—Emphysema and dilated heart. Glands large and engorged with blood. A few cocci seen in cover-glass preparations.

All cultures were sterile except one on agar-agar. Two colonies of a coccus developed here, and, on making sub-cultures, the organism proved to be staphylococcus pyogenes citreus.

Case 19. *Male*, 6.—Diphtheria of fauces and larynx. Glands much enlarged. Cover-glass preparations showed a fair number of cocci arranged as diplococci; capsules appeared to be present, but were ill-defined.

Cultures on agar-agar at 37° C. and gelatine cultures at 22° C. afforded abundance of minute colonies. A few larger white colonies were also developed, which proved on sub-culture to consist of bacillus coli. Milk inoculated from a gelatine culture of these larger colonies was coagulated in two days, and broth cultures gave a marked indol reaction.

Sub-cultures from the smaller minute colonies were not going, and presented the following characteristics :—

Gelatine.—Minute transparent colonies in two days.

Result as to Case No. 22.—Streptococcus albus, a bipolar bacillus, and bacillus coli.

Case 23. *Male*, 71.—Cerebral hæmorrhage. Glands large. In one cover-glass preparation a group of cocci was found.

Several organisms were obtained by cultivation. Three colonies of bacillus coli, and two colonies of a streptococcus rapidly liquefying gelatine. Streak cultures of the latter on gelatine showed liquefaction along the line of inoculation at the end of 24 hours; and stab cultures in gelatine show well-marked tubular liquefaction in two days, with a moderate, dense white, deposit: complete liquefaction occurred in six days. On agar-agar, at 37° C., there was in 24 hours a free growth of minute colonies, of almost the same colour as the culture medium, and a fair amount of deposit in the condensation fluid. Broth became densely cloudy in two days, and contained a moderate deposit. Microscopically, this organism also proved a streptococcus.

In addition, two colonies of a non-liquefying staphylococcus, one of diplococcus pneumoniæ, and one of streptococcus pyogenes, were also obtained from the glands in this case.

Case 24. *Male*, 49.—Cardiac failure. Glands of medium size. No organisms found in cover-glass preparations.

Several colonies of a staphylococcus developed on gelatine and on agar: their mode of growth was like that of a streptococcus, but their microscopical characters in agar-agar and broth culture showed them to be staphylococci.

Case 25. *Woman*, 65.—Dilated heart, secondary to emphysema. A few cocci arranged as diplococci were found in the cover-glass preparations.

Upon culture several colonies of bacillus coli, diplococcus pneumoniæ, and streptococcus pyogenes were obtained. Also one colony of proteus vulgaris, and one of a chromogenic bacillus.

Analysis of these other 10 cases gives the following results:—

I. *Staphylococci*:—
- A. Liquefying—
  1. Staphylococcus pyogenes citreus in one case.
  2. Staphylococcus pyogenes aureus in one case.
- B. Non-liquefying—
  1. A variety of staphylococcus growing freely on gelatine, but not very freely on agar-agar, in one case.
  2. A staphylococcus resembling a streptococcus in its mode of growth, in one case (No. 24).

Except this last, the staphylococci obtained were only present in cultures to the extent of two or three colonies.

II. *Streptococci*:—
1. Streptococcus pyogenes was present in five cases; never more than two or three colonies.
2. Streptococcus brevis, in one case.
3. Streptococcus albus, in one case.
4. Streptococcus liquefaciens, in one case (No. 23).

III. *Diplococcus Pneumoniæ*, in three cases.

IV. *Bacilli*:—
1. Bacillus coli communis, in five cases.
2. Proteus vulgaris, in two cases.
3. Three other varieties of bacillus, none numerous, in three cases (Nos. 20, 22, 25).

No. 8

On Micro-Organisms found in the Mesenteric Glands; by Edmund Cautley, M.D.

As regards the absorption of micro-organisms from the interior of the healthy intestine, the only channels for their passage, leaving out of account localised penetration of and growth through the mucous membrane (as, for instance, in ulceration), are the blood vessels and the lymphatics.

As to absorption of microbes by the blood vessels of the intestines, little, however, is known, the evidence in regard of infections received by way of the alimentary tract pointing in the main to absorption of their particulate causes by the lymphatics; as for instance in milk scarlatina, in milk typhoid, and in intestinal tuberculosis.

It is therefore interesting to ascertain which of the numerous bacteria inhabiting the alimentary canal can pass into the lymph stream, *i.e.*, into the mesenteric glands.

Three questions naturally arise here, namely:—

1. Are organisms present in the mesenteric glands?
2. If organisms are present there, are they living?
3. If living organisms are present, what varieties are commonly found?

In order to investigate these points, the mesenteric glands were taken from the bodies of various persons, 25 in number,* who died in the hospital. As far as possible, the cases selected were those of persons who had died from accident or from disease in which there was no suggestion of septicæmic infection. No case was examined if there were definite signs of decomposition; and care was exercised not to take mesenteric glands from cases in which the small intestine presented to the naked eye any sign of disease.

The method of investigation consisted in removing the glands from the body, placing them in a saturated solution of perchloride of mercury for a few seconds in order to destroy any surface contaminations, and drying them on sterilized filter paper. They were then opened with a sterilized knife, and three gelatine and three agar-agar cultures were inoculated with the gland juice, freely smeared over the surface. The gelatine cultures were incubated at 20° C., and the agar-agar cultures at 37° C. Sub-cultures were made from any colonies which grew on these or on certain other nutrient media which were also employed. Four coverglass preparations were also made from the fresh gland juice; dried over the flame, and stained in various aniline dyes.

Case 1. *Male*, 71.—Cerebral hæmorrhage.

Case 2. *Male*, 75.—Meningeal hæmorrhage.

Case 3. *Male*, 69.—Cerebral hæmorrhage

In these three cases the glands were small. No organisms were found in stained coverglass preparations of the fresh gland-juice, and none were obtained by cultivation on gelatine or on agar-agar.

* The bronchial glands of all 25, except Nos. 4, 9, 17, 18, and 22, were also examined; account of this examination is given in the preceding paper.

Case 4. *Male*, 47.—Cerebral hæmorrhage. Coverglass prep crowded with cocci; cultures sterile.

Case 5. *Male*, 41.—Hæmorrhage from the lungs, due to Glands of medium size; no organisms found.

Case 6. *Male*, 30.—Cardiac failure, secondary to morbu Glands of medium size; no organisms found.

Case 7. *Female*, 12.—Cardiac failure, secondary to mitral Glands of medium size. A few long rods found in coverglass tions, but no organisms obtained by cultivation.

Case 8. *Female*, 25.—Hæmatemesis. Glands small, sterile; many cocci, isolated and in groups, found in co preparations.

Case 9. *Male*, 16.—Fractured skull. Glands of medium s organisms found.

Case 10. *Female*, 6.—Laryngeal diphtheria. Glands smal cocci found in coverglass preparations; no growth on culture me

Case 11. *Male*, 4.—Laryngeal diphtheria. Glands larg organisms found.

Case 12. *Male*, 2.—Tubercular meningitis. Glands large. cocci, one large rod-shaped bacillus and one small bacillus, fo coverglass preparations. Cultures sterile.

Case 13. *Male*, 1¾.—Tubercular meningitis. Glands large. cocci, arranged in chains, found in coverglass preparations. Cu sterile.

Case 14. *Male*, 4.—Double otitis media. Glands large. organisms found.

Case 15. *Female*, 5 *months*.—Marasmus. Glands of medium No organisms found.

In these 15 cases no organisms were obtained from the glan cultivation by means of the methods above described. In nine o the 15 no organisms were found in the coverglass preparations. the remaining six, organisms were found in coverglass preparat numerous in two of the five.

In the next succeeding 10 cases, various organisms were obtaine cultivation on gelatine at 20° C. or on agar-agar at 37° C. In of these other 10 cases, organisms were detected in the cover preparations; in some they were not.

Case 16. *Female*, 40.—Pernicious anaemia. Glands large hæmorrhagic. Nothing found in coverglass preparations. Al culture tubes proved sterile, with the exception of one gelatine tu which there was a single minute colony. Subcultures from th gelatine, agar-agar, and in broth showed the organism of this colo be streptococcus pyogenes.

Case 17. *Male*, 3.—Laryngeal and faucial diphtheria. Glands large. Only a single colony appeared in one of the six culture tubes inoculated. Microscopically this proved to be a very minute staphylococcus. As to its cultural characters: on gelatine it formed a delicate filmy growth of minute colonies: on agar-agar at 37° C. a fairly definite growth appeared along the line of inoculation and considerable deposit formed in the water of condensation.

Case 18. *Male*, 42.—Fractured skull. Glands of medium size. No organisms found in coverglass preparations. By cultivation there were obtained:—

(1.) One colony of bacillus coli.

(2.) Three colonies of staphylococcus aureus.

Case 19. *Male*, 49.—Cardiac failure, secondary to emphysema. Glands very small. A few cocci found in coverglass preparations, and several colonies of streptococcus pyogenes obtained by culture.

Case 20. *Female*, 23.—Cardiac failure, secondary to morbus cordis. Glands small. No organisms found in coverglass preparations. By culture only three colonies in all were obtained, and these developed in one of the gelatine cultures. Two out of the three liquefied gelatine, and on subculture gave results as follows:—

On *gelatine*.—In two days considerable liquefaction along the line of inoculation, and yellow deposit formed; the gelatine almost completely liquefied in nine days.

On *agar-agar* at 37° C.—Scanty growth in four days, with yellowish tinge in growth, and deposit in the condensation fluid.

Broth at 37° C.—At the end of 24 hours the medium was turbid and contained a moderate deposit. In four days the deposit was well marked and pale yellow in colour.

Microscopically, the organism proved a minute coccus forming zoogloea and short chains.

The third colony yielded a well-defined, raised, but not extensive growth on gelatine; a thicker and more extensive growth on agar-agar. Broth became turbid and contained a moderate deposit. Gelatine not liquefied. Microscopically, this was a staphylococcus.

Result as regards *Case* 20.—Two colonies of staphylococcus pyogenes citreus; one colony of a non-liquefying staphylococcus albus.

Case 21. *Female*, 65. Cardiac failure, secondary to emphysema. Glands small. No organisms seen in coverglass preparations. Both agar-agar cultures, at 37° C., and gelatine cultures, at 20° C., yielded one and the same organism in fairly large number. Characters on subculture:—

On *gelatine:* in three days minute colonies along the line of inoculation.

On *agar-agar:* minute whitish, almost transparent, colonies; scanty deposit in the condensation fluid.

Broth, became faintly turbid in two days and contained only a trace of deposit.

When the growth presented a greyish centre and more transparent peripheral portion; sending out processes with rounded ends. On *agar-agar* at 37° C. minute round white colonies appeared, and shreddy deposit in the condensation fluid developed in 24 hours. Subcultures in broth in 24 hours became moderately turbid and contained a scanty deposit. Microscopically, the organism is a coccus forming chains.

Result as regards *Case* 24,—A pure culture of a streptococcus; possibly the streptococcus brevis of Von Lingelsheim.

Case 25. *Male*, 20.—Ruptured liver. Glands small. No organisms found in coverglass preparations. From the gland juice there were by culture three varieties of staphylococcus:—

1. Staphylococcus pyogenes aureus.
2. A non-liquefying chromogenic staphylococcus, producing a narrow, delicate, yellow coloured growth on gelatine.
3. A single colony of a staphylococcus resembling staphylococcus albus, except that it did not liquefy gelatine.

Analysis of the above cases gives the following results. In 15 out of 25 cases no living organisms were found in the juice of the mesenteric glands. In six out of these 15, such organisms as were found were discovered in coverglass preparations only. In the remaining 10 cases, cultures of the gland juice produced colonies. In two of the 10 only a single colony in each instance was found in the six tubes inoculated with the gland juice; and in these two there were no organisms discoverable in the coverglass preparations.

The organisms found were the following, their number and variety being surprisingly small:—

Staphylococci:—

A. Liquefying gelatine.
   1. Staphylococcus pyogenes aureus in two cases.
   2. Staphylococcus citreus in one case.
   3. Staphylococcus; very like citreus in one case.
   4. Staphylococcus albus in one case.

B. Not liquefying gelatine.
   1. Staphylococcus, chromogenic, yellow, in one case.
   2. Staphylococcus, not chromogenic, in one case.
   3. Staphylococcus, growing somewhat like a streptococcus in one case.

Streptococci:—

1. Streptococcus pyogenes in two cases.
2. Streptococcus brevis of Von Lingelsheim (?) in one case.

Bacilli:—

1. Bacillus coli communis in two cases.
2. Influenza bacillus in one case.
3. Long rod-shaped bacillus, growing on gelatine in one case.
4. Long rod-shaped bacillus, not growing on gelatine in one case.

From the above observations it would appear that the mesenteric glands, whether in health (as in the cases of death from accident) or

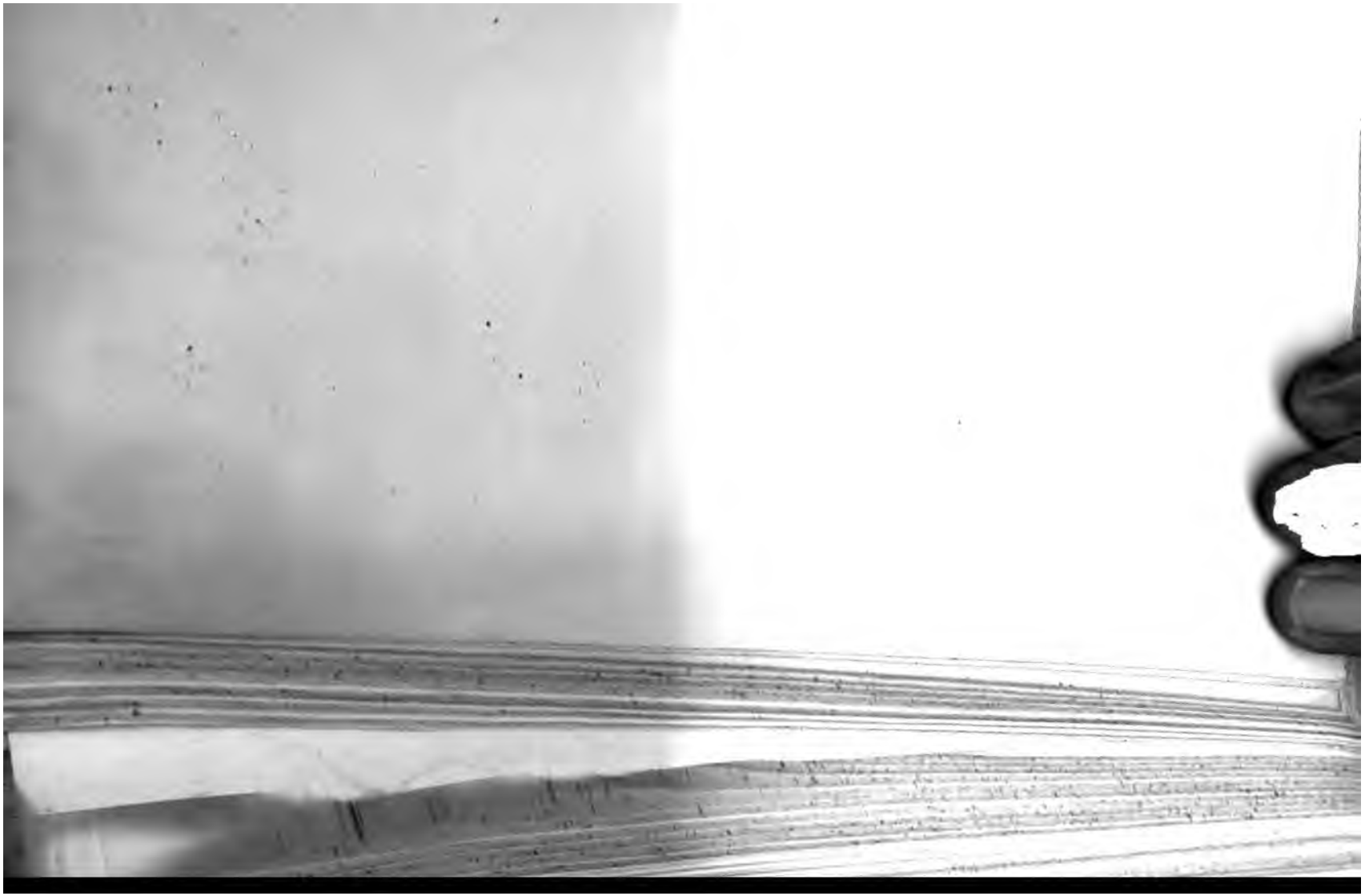
in disease of various kinds, are not **normally** crowded with
Very often indeed in these experiments the glands wer
contain no living organisms.

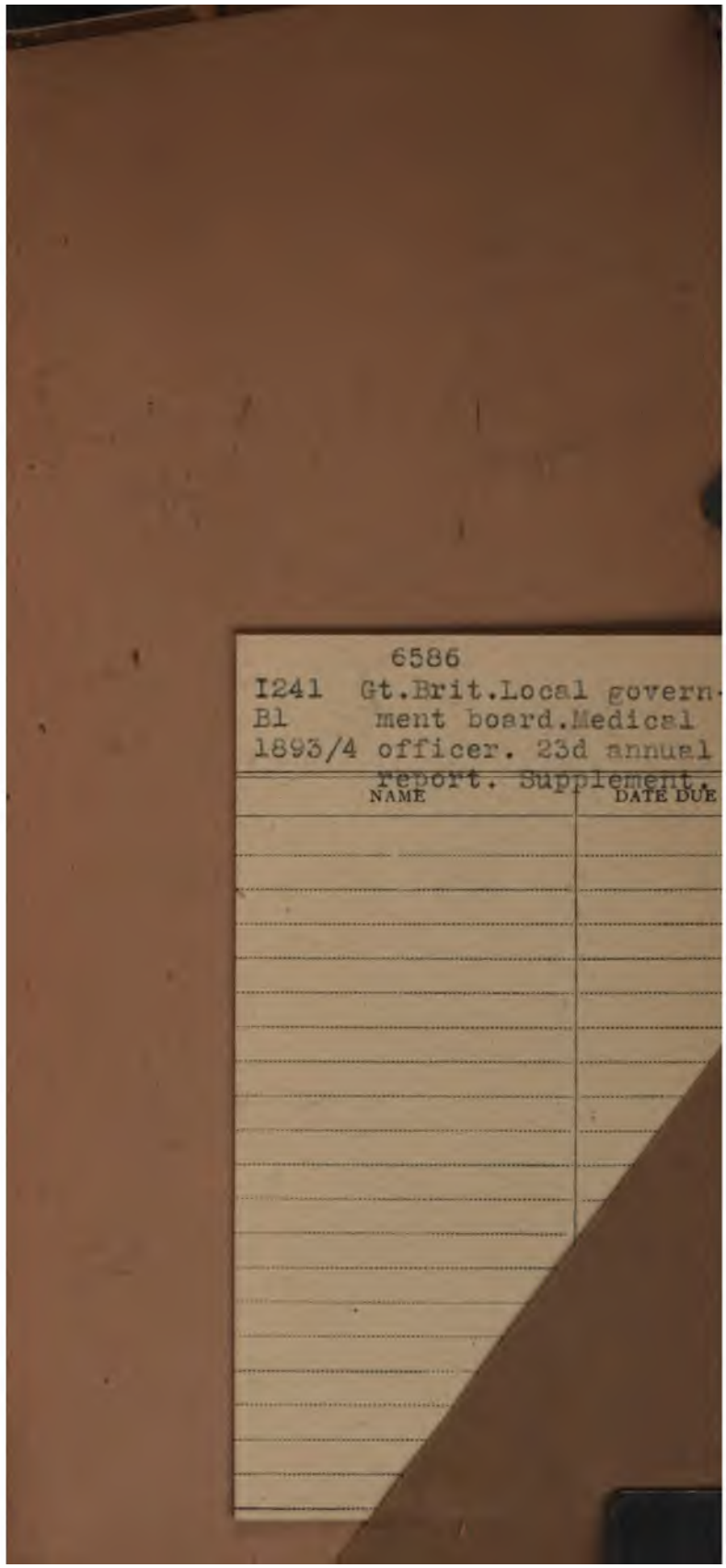
The conclusions I draw are as follows:—

Firstly. Organisms do reach the mesenteric glands, but n
numbers.

Secondly. Many of those which reach these glands do
their vitality.

Thirdly. The organisms found by me in these glands a
are commonly found in the alimentary canal.

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